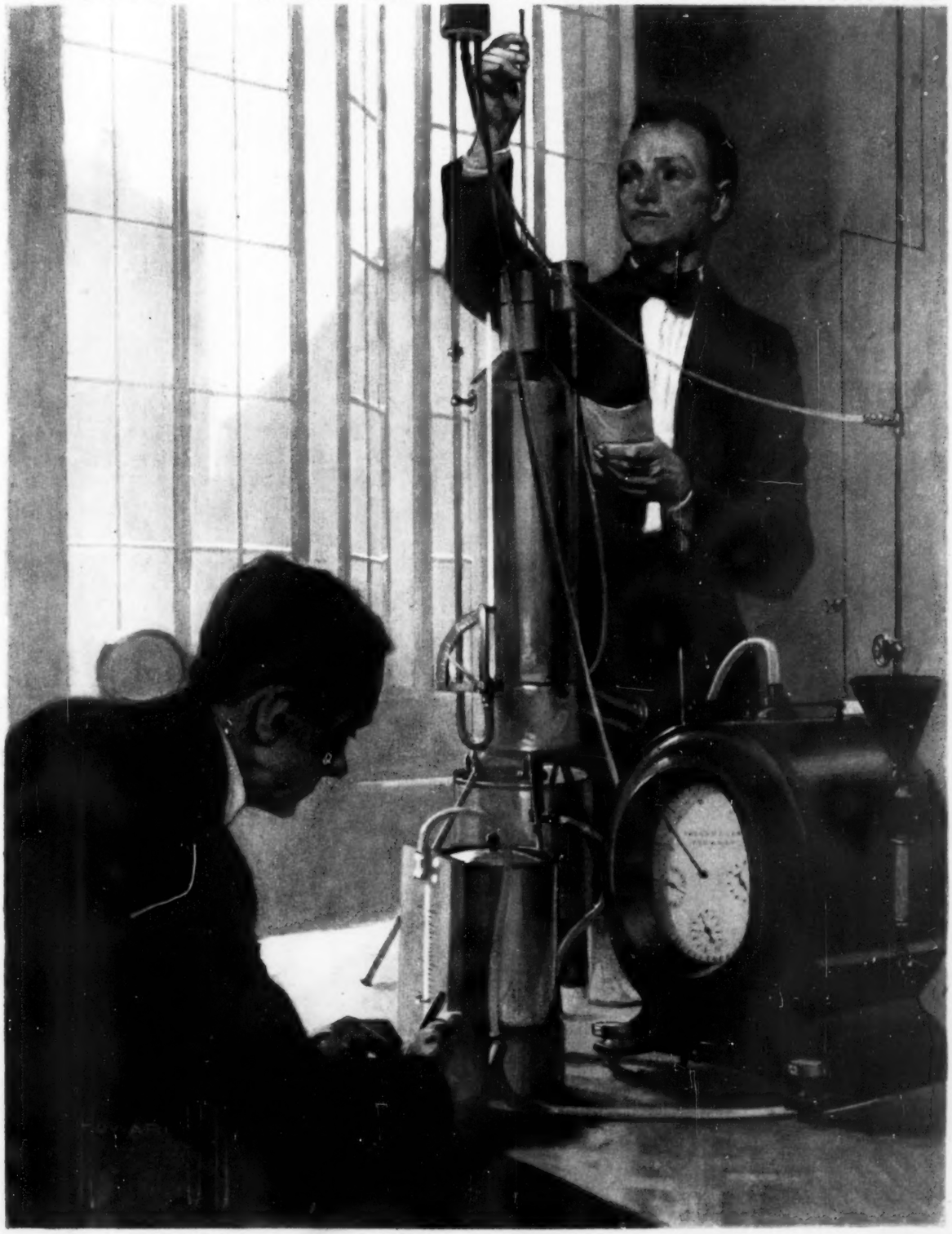
IN THIS ISSUE:

A NEW DEAL IN TRANSPORTATION
WHAT ABOUT OUR WHEAT PRODUCTION?

SCIENTIFIC AMERICAN

A Weekly Review of Progress in

INDUSTRY · SCIENCE · INVENTION · MECHANICS



WITH THE CHEMISTS WHO KEEP TABS ON OUR LEADING INDUSTRIES

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A significant tribute

"We expect to finish the big dam this week. Before I leave I want to pay my respects to the Bull Dog Mack. It is the most wonderful truck I have ever seen in my extensive experience with all kinds of motor truck equipment".—*From one letter of hundreds we should like you to read.*

THE Mack is distinctively an *engineered* truck. Its supremacy rests upon three essential elements of truck efficiency—dependability, economy and endurance. It was designed to do big things in a big way—easily. That it does this is vouched for by the enthusiastic approval of Mack owners everywhere.

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Capacities 1½ to 7½ tons. Tractors to 15 tons

Our latest catalogues, Nos. 13 and 39, contain detailed descriptions of the many exclusive features that have made Mack supremacy possible, together with the complete specifications of every model. Send for them today.

INTERNATIONAL MOTOR COMPANY, NEW YORK

Mack TRUCKS

"PERFORMANCE COUNTS"

STRENGTH

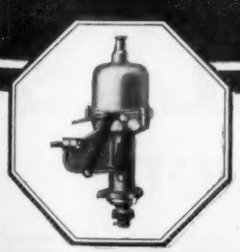
WITH PLENTY OF MARGIN FOR THE EMERGENCY

FROM the standpoint of materials, it is reasonable to assume that every motor truck is strong. The intelligent truck purchaser can judge material strength by appearance. But continuous performance demands strength of design to supplement strength of materials. It is an honest combination of the two which enables the Clydesdale truck to serve its owner faithfully without costly interruptions.

For instance, the Clydesdale frame is of pressed steel, *shaped so that the greatest strength comes at the point of greatest strain.* It is two inches deeper than the average, and is gusseted at every corner and cross member, so that no twist of road or load can possibly bend it. Compare this construction with rolled steel frames which cannot be so shaped, and one reason for Clydesdale sturdiness is apparent. Fewer repairs and slower depreciation are worth considering.

THE CLYDESDALE MOTOR TRUCK CO.
CLYDE, OHIO

CLYDESDALE MOTOR TRUCKS



How This Controller Conserves Strength

The strength of most trucks is taxed to the utmost by the sudden strain put upon them when the motor is raced to get the load quickly under way. The speed of the motor is too great for the starting speed of the rear wheels, and every part is called upon to stand the shock until the speed is equalized. With the Clydesdale Controller to act on the gas supply, this cannot happen, since the motor starts the load *slowly* and picks up gradually to the speed set on the throttle. No part is jerked into doing more than its share.

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According to the National Board of Fire Underwriters, one of the chief causes of community fires is the inflammable roof. Over a hundred cities and towns throughout the United States now have ordinances against this menace.

The Scare Circle

SUDDENLY, without warning—Fate takes up the compass and putting down the pointer on some peaceful community, she decrees "This place shall be burned." Then swinging an arc she draws a circle—"These people shall be fear-stricken."

In the scare circle, around the fire, the horror of what might have been, brings fire prevention home to those in it and with sharpened realization Insurance is written, legislation is rushed through, fire safety devices become necessities, fire safe roofings compulsory.

And all this is perfectly human and in its restricted effect, it is the price a locality pays for greater fire safety.

But the scare circle is no longer a mere local panic. It has widened in significance, for today our fire loss is a National scandal, a cause for general concern.

Public men speak of it with grave emphasis, organized safety bodies deplore it. For fire prevention is no trumped up propaganda, no phantasy of the imagination. It is a living blight right here among us, blocking and mocking our plans to catch up in our building program; burning down ten buildings while we plan a hundred; squandering wealth; diverting labor and disturbing the very tranquility on which our development depends.

Fire prevention is a national responsibility. But it is more one of personal action than legislation. To each of us some preventative measure is possible. Each must set up his own safeguards to fortify his own property.

The spread of fire is nothing more than one building catching the flame from another, usually from roof to roof. So the roof is one of the most vulnerable spots where fire can strike.

That is why Johns-Manville Asbestos Roofing is recognized everywhere as an important prevention against fire's spread. For, it is the only all-mineral roofing felt and so while possessing all the flexibility of fabric and adaptable therefore to all kinds of roof surfaces, it is at the same time inert to fire, weather and fungi.

So Johns-Manville Asbestos Roofing either in its "built up" or "ready roll" form or as shingles, is not only fire-immune but the most remarkable of roofings. Because it is all mineral it is impervious to all the ravages to which ordinary roofings are subject.

It is economical because it lasts for the life of the building without need of repair or paint. Truly the most desirable roofing on all counts.

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Asbestos
and its allied products

INSULATION
that keeps the heat where it belongs
CEMENTS
that make boiler walls leak-proof
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that cut down fire risks
PACKINGS
that save power waste
LININGS
that make brakes safe
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE
Serves in Conservation

SEVENTY-SIXTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXXIII
NUMBER 15

NEW YORK, OCTOBER 9, 1920

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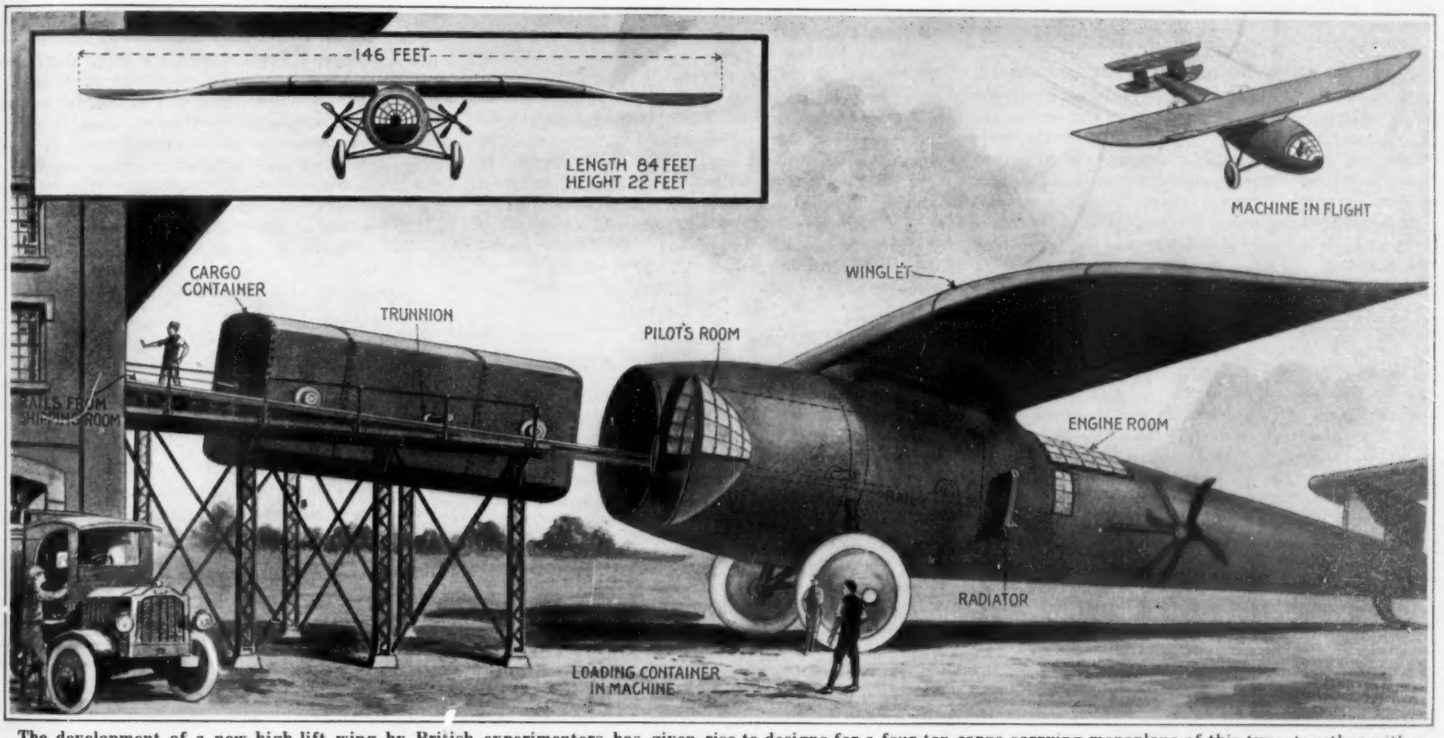

The development of a new high-lift wing by British experimenters has given rise to designs for a four-ton cargo-carrying monoplane of this type, together with a system of rapid loading and unloading as here depicted

The High-Lift Wing and Commercial Aviation

LET us be perfectly frank in the matter of commercial aviation. We must admit by now that just so long as we stick to the present principles of design and construction, just so long do we defer the extensive employment of airplanes for passenger and cargo carrying on anything like a large scale. For it is obvious to even the layman that our present costs of operation are far too heavy to make commercial aviation commonplace. We must take it out of the luxury class to make it an everyday commodity.

Aeronautical constructors, realizing the aforementioned conditions, have been striving for years back to increase the efficiency of the large airplane, or to put it another way, lower the operating costs. Here and there certain efforts are now being consummated in the form of improved propellers, engines, and, most important of all, high-lift wings. Indeed, it seems that certain of these efforts are well along the right road and that commercial aviation is about to enter a new and more practical era.

Not so long ago Mr. Handley-Page, the well-known British aeronautical constructor, announced a new wing which had been developed and for which he claimed a considerable gain in efficiency over the usual types. And more recently a group of British experimenters have introduced a new wing which has been tried with most promising results. It is with the latter that we have to deal in the following lines.

The new wing, which has been named the "Alula," is the result of some eight or nine years of steady experimentation on small and full scale models and the expenditure of no mean sum of money. All these experiments have been directed toward producing a wing with high lifting power and low head resistance. The experimenters argued that this could only be obtained by discovering a wing which produced over its surface the type of air flow known as "irrotational" or "two dimensional"; that is to say, an air flow moving along a line which only rises or falls, but does not move sideways in a third dimension.

This type of air flow is obviously strictly parallel to the direction of flight, and so it may be assumed that none of the energy imparted to the air is wasted in side movement. The idea is, in effect, the idea of the perfect stream-lined strut or fuselage applied to the wing itself, in relation to which designers have hitherto been singularly careless in this respect.

It is claimed for the new wing that it eliminates all "end losses" and leakage, which reduce the efficiency of other wings and waste much energy in vortices. And thus it is claimed that a high percentage of the power put into the wing by the engine is given back in actual lifting power, which is as it should be in a vehicle dealing with that most elastic of all substances —the air.

As the result of the prolonged period of experimentation already referred to, it is now possible to vary all the features or factors of a wing in unison—or perhaps one should rather say, in harmony; so that when it is necessary to vary one dimension of a wing, all the other component dimensions may be varied in proportion and pre-ordained results may be obtained. It is of interest to learn that the wing shape produced resembles closely the wings of the most powerful birds, although the experimenters and Nature apparently arrived at the same conclusion by different methods.

The experimental machine, which is a species of parasol monoplane, with the wings raised above the slipstream of the tractor screw, has made successful flights. Pilots will be interested to hear that the machine equipped with the new wings refuses to obey the control of ailerons, and that it is controlled laterally by moving a hinged portion of the leading edge of each wing. This movement controls the direction of the machine as well as its lateral position, so that the rudder is not used in conjunction with the lateral control—which feature, according to our worthy contemporary, *The Aeroplane*, to whom we are indebted for many of these facts, would seem to abolish the Wright patents. Also, it is stated that if the slip stream of a tractor screw is allowed to flow over the wings, it entirely spoils their lifting power.

Actual designs have been prepared with a view to applying the new wings to commercial purposes. These call for a cargo machine to carry four tons. The proposed machine, known as the "Pelican Four-Ton Lorry," is a colossal cantilever monoplane designed for two 400-horse-power Napier engines. Its cruising speed is 72 miles per hour, its top speed 96 miles per hour, and its landing speed 55 miles per hour. Its total weight is to be 24,100 pounds. The wing loading figures out at 12.9 pounds per square foot. The useful load is four tons, with sufficient fuel for the London-Paris journey. Most interesting of all, however, is the novel system of quick loading and unloading which has been planned. This permits of handling shipments with the utmost speed, and is based on a similar practice in the motor truck field. Idle airplanes mean a large idle capital, hence the designers plan to keep the airplane in the air for the greater part of the time.

SCIENTIFIC AMERICAN

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

For an Independent Naval Air Service

AS a result of the extravagance which marked our efforts to build up a powerful air service and place a large fleet of machines at the front during the late war, there is a movement afoot to combine all our activities in one united aviation service. Although powerful arguments were brought forth this year in favor of the measure, it was realized that there were many defects in the measure and the proposition was defeated.

In no quarter did such strong opposition develop as in the Navy Department, where it was felt that the propaganda which was carried on in support of the bill contained many flagrantly inaccurate and misleading statements concerning naval aviation, and that if the bill became law, it would result in taking away from the Navy the control of its own activities in the air. The SCIENTIFIC AMERICAN has already gone on record as favoring a certain measure of unification, at least so far as the matter of appropriations is concerned; but we believe the Navy is absolutely in the right when it demands that in respect to design and construction of engines and machines, in the training of personnel and in the disposition and control of its own airplane forces, it should be left absolutely supreme.

Both precedent and common sense call for the organization within the Navy of a Bureau of Aviation, which shall control its own aviation activities and coördinate them with those of the Army. It is believed that, only if the Navy has a bureau organization for aviation, will it be able to take the strong position in the air which rightly belongs to it. Failing the establishment of such a bureau, aviation will drag along in the more or less haphazard way that has characterized the development of the submarine.

Aviation is so unlike any other branch of naval activity that it is entitled to a separate bureau of its own. The design and construction of the hull of a warship is an entirely distinct activity from that of designing its engines, and the design and construction of the guns and armor are as widely distinct from both. Consequently, we have already in the Navy the separate bureaus of Construction and Repair, Steam Engineering, and Ordnance. But if each of these is so individual as to require its separate bureau, how much more so is aviation! Unlike the three mentioned, it is a new art which only yesterday was in its infancy. We venture to say that it is the most difficult of the four, surpassing them in its complexities and in the number of its major and unsolved problems. It is evident that industrially, in the preparation for war, the matter of aviation organization is of prime importance. Congress and the public are familiar with the figures giving the expenditures for aviation in the Army and Navy during the recent conflict. They know also what results were achieved. The first thought that comes to any of us when we consider the future of governmental expenditures is, how may the extravagant wastefulness displayed during the recent war be avoided if, unhappily, we should find ourselves concerned in another war. In considering the question, one fails to see any organization in effect today which is greatly superior to that which existed in 1917.

If, in the forthcoming discussion of this matter, there is found to be a general agreement that we should have a united air service, we are strongly of the opinion that such an air service should concern itself only with general coördination in the matter of the allotment of the appropriations provided by Congress. It should leave to the separate departments, War, Navy, Post Office, et cetera, the determination of all technical matters; for only the experts in these several departments are familiar with the various problems to be solved, and they alone are qualified by knowledge and experience to make the best solution.

It is particularly in this last regard that the naval authorities demand that they be given an absolutely free hand. The art which has to do with the design, construction and operation of warships is in a class by itself. Familiarity with its problems can be gained only by long and intensive training, and the problems which arise in naval aviation, whether it be in strategy or tactics, are quite distinct from the roughly parallel problems of the army service.

In conclusion, let us bear in mind that so far as production in time of peace is concerned, the number of planes produced for governmental purposes is not numerous. Moreover, since all of the work, whether for Army, Navy, or Post Office, is experimental and progressive, standardization at the present time of types of machines and mechanisms is undesirable, if not impossible. It is desirable that the various problems should be attacked by many minds rather than by an individual organization, the results of these separate efforts to be of course coördinated. We believe, moreover, that prizes and rewards should be offered to civil competitors for excellence in designs of machines and mechanisms—an attitude on the part of the Government which we believe would greatly stimulate the art.

Safeguarding the Weapons of Science

THE horrible crime which was recently perpetrated in the heart of the Wall Street district reminds us that the powerful agencies which the developments of science have put into our hands for the prosecution of works of utility may be used by vicious and depraved minds for wholesale destruction of life and property. It is but small consolation to realize that this tragedy will concentrate public attention upon the fact that the manufacture, sale and use of high explosives must henceforth, in the interest of public safety, be surrounded with a double safeguard. The unfortunates who were killed and mutilated will have died and suffered in vain if the authorities do not take up this whole question and enact legislation that will make the repetition of such crimes extremely difficult, if not impossible. Offenses like this remind us that the benevolent fruits of our progress in discovering and manipulating the forces of nature have something of the effect of a two-edged sword. Directed to their proper and intended uses, modern inventions have done more to promote material comfort in the past century than was achieved in all the previous history of the world; but we must not forget that in the hands of the depraved and vicious, these same inventions may be used with deadly and far-reaching effect as instruments of malice and revenge. The criminal who breaks into the home goes armed with the finest automatic weapons, and rarely today is the robbery of a bank attempted without the accessory of a waiting automobile at the sidewalk.

It is one of the baneful legacies of the war that it has furnished the criminal with more deadly weapons such as poison gas and the hand grenade, and it takes no great stretch of the imagination to conceive of the airplane being pressed into service as a sure means of obliterating the trail of the man who has taken the life or seized the property of the law-abiding citizen.

The use of modern inventions for criminal purposes has been foreshadowed by more than one of the popular scientific writers of fiction. We can all remember with what frequency during the war both sides were credited with having made use of virulent germs as a secret and deadly means of exterminating the enemy population; and to the lunatic as distinct from the more positively criminal type this agent of destruction might make a particular appeal.

Now it should not be beyond the resources of our highly developed civilization to find ways and means of restricting the more potent and deadly substances and appliances to their proper uses. It may be found that to do this would involve a strict supervision of the individual citizen and a certain restriction of his individual liberty. If so, he can comfort himself with the thought that it is a universal law of life that the many may be called upon, at times, to suffer discomfort because of the vicious tendencies of the few. To the law-abiding citizen, the thought of close supervision is unpalatable, if not repulsive; and it is not likely that in the immediate future we shall come to any such conditions. Nevertheless, the experience of the two years which have intervened since the armistice proves beyond a doubt that crime is tending to make an increasing use, or rather misuse, of the weapons which, largely as the result of the war, have been thrown in its way.

There has always been a strong prejudice among us against the methods of police registration and supervision which have characterized some of the countries of Europe; but our prejudice has been mainly against the motive of this rather than against the supervision itself. Certainly there is something wrong with the present conditions when one man, or several criminals working together, can prepare a huge bomb, load in on to an open wagon, haul it at the busiest hour of the day into the most densely crowded center of the city, and there set it off, all apparently according to carefully calculated time and schedule. If any scheme of general registration can successfully combat this sort of thing, it is a cheap price indeed to pay for the safety of society.

Rounding Out the State Barge Canal

THE State Barge Canal as an engineering structure is an accomplished fact. Although the work remaining to be done is of a subsidiary character, it is of a kind that is absolutely essential if the canal is to realize its full traffic potentialities. This work consists in the construction or completion of proper dock facilities not only at the terminals on Lake Erie and at the Port of New York, but also at the various shipping points along the canal.

Foremost among these works is the provision of suitable terminal grain elevators at Buffalo and New York; for it must not be forgotten that it was largely the Erie Canal which gained for New York the position which it once held in the grain trade. It has long been realized that before private capital will build the necessary barges the State must provide terminal grain elevators designed especially to accommodate barge canal traffic. The existing grain elevators are owned by the railroad companies, and naturally the grain that comes to New York by railroad will have the first call upon these facilities.

For these reasons, those who are anxious to see the grain trade to this city win back its former position will welcome the announcement of the State Engineer that the plans for the public grain elevators have been completed and will soon be presented to the Canal Board for approval. These plans, which have been approved by a committee appointed by the New York Produce Exchange to coöperate with the State Engineering Department, are to have a capacity of 2,000,000 bushels of grain, with provisions to increase this whenever future developments of traffic call for it.

It is gratifying to know that the Barge Canal is proving to be adequate and efficient, testimony to this fact having recently been furnished in a report by a corporation which is operating fleets of modern steel barges on the canal and which contemplates extensive additions to its facilities in the near future. The report states that the vast possibilities of the canal as a link between the Great Lakes and the sea were duly considered by the officials of the corporation while its barge fleets were in contemplation. Each unit of its fleet averages eight days between the Hudson River and Lake Erie. These units consist of four barges of 400 tons deadweight, each towed by a steam tug, the fleet moving as much as could be carried in three train loads of 50 cars with a minimum of twelve tons in each car. The company states that the buoying of the canal and its general upkeep is very satisfactory, and it is believed that America's inland waterways will be second in importance within a few years' time to the present great development in deep sea shipping.

Electricity

Simplifying the Radio Telephone.—There has recently been introduced a radio telephone outfit which operates without a "B" battery or external source of high potential. The entire outfit may be readily transported. The transmitter weighs 60 pounds, including two six-volt storage batteries. It operates with any suitable type of receiver and audion detector, with or without an audion amplifier, depending on the range, loudness and so on. The set is designed to operate an antenna whose capacity to earth varies from 0.002 mf. to 0.0007 mf., although it may be used on even smaller antennæ.

Electric Heating in Switzerland.—An authority has recently undertaken an analysis of the heat energy required in Switzerland's climate and finds that on an average 2,500 kilowatt hours per person in the winter season will be sufficient for heating not only residential apartments but also offices, factories, and so on. For the heating only a total of 10,000,000,000 kilowatt hours would be required per year in Switzerland, or just one-half of the maximum total of hydraulic energy which could be utilized per year by careful development of all available waterfalls. A difficulty with electric heating is the seasonable demand, which prevents a high economy. The author does not expect a general application of electricity for heating purposes.

Electric Vehicle Progress.—A rather complete survey of the electric vehicle field is presented by F. Ayton in a recent issue of *The Electrician*. It is stated that in England the superiority of the electric truck for delivery and other service in urban and suburban areas has been admitted. Moreover, the soaring cost of fuel for the internal-combustion engine, not to speak of the extremely heavy cost of keeping in repair vehicles fitted with this type of motor, is giving a greater and yet greater advantage to the simple and economic "electric." These facts apply to conditions in England, of course, where fuel is exceptionally high. Attention is also called to the DeMartis lead type of "lead-acid" battery of Italian origin, in which it is claimed that by the use of a special paste which combines extreme hardness with great porosity, formation of lead sulfate is prevented. Other advantages claimed for this battery are higher capacity for the same weight, slightly higher voltage on discharge, and increased watt-hour efficiency.

Why Not Electrify Railroads Now?—It is the consensus of opinion among manufacturers of electrical equipment and supplies that the next year or two will see a great boom in the electrification of our leading railroads. Now that the railroads are facing the stern necessity of purchasing new equipment not only to replace that which has become obsolete, but also to take care of the increased traffic, it would seem that the opportune moment has arrived for electrification on a large scale. Ultimately, it is argued, the railroads must come to electric operation, and the longer they put off the conversion the more equipment they are certain to pile up against the day when it must be scrapped. Furthermore, electrical men claim that the increased efficiency of electrified railroads would go a long way toward making up the cost of the change at this time. The main deterrent at this moment seems to be the financial situation, which does not favor the expenditure of vast sums of money on anything which does not promise an immediate and profitable return. Nevertheless, it would appear that the ultimate economies to be attained through electrification are sufficiently attractive to make it decidedly worth while for our railroads to go to some effort to take advantage of them; so we look for at least partial electrification on a notable scale in the near future.

Science

Eruption of a Geyser in France.—A French geologist, M. Glangeaud, has transmitted to the French Academy of Sciences a report on a geyser-like phenomenon recently produced in the course of the boring of a well in search of petroleum on the plains of La Limagne. The hole had reached a depth of about 500 feet when there was a sudden eruption of boiling water, which rose above ground in a jet 130 feet high and hurled the boring tools, weighing two tons, into the air. Hot water was still flowing from the well at the time of the report. The water, which has been analyzed, is highly charged with carbonate of soda and other salts, as well as carbon dioxide.

The Velocity of Explosive Sounds.—The sound-waves produced in air by a sudden explosion travel at first faster than do ordinary sound-waves. Some interesting experiments have recently been carried out by Dr. Dayton C. Miller for the purpose of obtaining exact data on this point. The experiments were made during the firing of large guns, mostly 10-inch and 12-inch rifles, at the Sandy Hook Proving Ground. The amount of powder charge and the value of the internal pressure developed in the gun were taken into account. The sounds were received by specially constructed carbon-granule microphones, and by others of a very sensitive type. The records were made by a moving-film camera in connection with a string-galvanometer capable of recording from six stations simultaneously; the same type of apparatus used by the army for sound-ranging. Stations were located at the muzzle of the gun, and at various distances up to 21,000 feet. Detailed meteorological observations were made during the experiments. Dr. Miller's investigations prove that the velocity of the explosive sound at a distance of 100 feet from a 10-inch gun is about 1,240 feet per second, or 22 per cent above normal. At 200 feet it is only about 5 per cent above normal. For all distance above 500 feet the velocity of the sounds produced by the largest sized gun is practically normal.

CONDITIONS FOR THE $5,000 PRIZE EINSTEIN ESSAY CONTEST

1. No essay shall be longer than 3,000 words.

2. All essays must be in English, and written as simply, lucidly and non-technically as possible.

3. Each essay must be typewritten, and identified with a pseudonym. The essay shall bear a title and the author's pseudonym *only*, and must be enclosed in a plain sealed envelope likewise bearing this pseudonym. In the same package with the essay must be sent a second plain sealed envelope, also labelled with the pseudonym, and containing a statement of the name and address of the contestant, the pseudonym used, and the title of the essay. It is necessary to follow these instructions implicitly, in order to guard against confusion in opening the envelopes and assigning the pseudonyms to their proprietors, especially in view of the possibility that two of the contestants may employ the same pseudonym. The envelopes should be sent in a single package to the Einstein Prize Essay Editor, SCIENTIFIC AMERICAN, 233 Broadway, New York.

4. All essays must be in the office of the SCIENTIFIC AMERICAN by November 1st, 1920.

5. The Editor of the SCIENTIFIC AMERICAN will retain the small sealed envelopes containing the competitors' names and addresses, which will not be opened until the competitive essays have been passed upon and the winning essay selected.

6. As soon as the judges have selected the winning essay, they will notify the Editor, who will open the envelope bearing the proper pseudonym and revealing the competitor's true name. The competitor will at once be notified that he has won, and his essay will be published in an early issue of the SCIENTIFIC AMERICAN.

7. There shall be but one prize, of FIVE THOUSAND DOLLARS, to go to the author of the best essay submitted.

8. The SCIENTIFIC AMERICAN reserves the right to publish in its columns, or in those of the SCIENTIFIC AMERICAN MONTHLY, or in book form, any of the essays which may be deemed worthy of this. Aside from such rights, the essays shall remain the properties of their authors; but no manuscripts can be returned.

9. The Committee of Judges will consist of Professors Leigh Page of Yale and E. P. Adams of Princeton. In the event that they are unable to agree on the best essay, the Einstein Prize Essay Editor will cast the deciding vote.

Aeronautics

Aerial Transport in Kongo.—A dispatch from Brussels says that the mission charged with organizing aerial transport in Kongo, Africa, is actively continuing its work. The first hydro-airplane flight took place some time ago between Kinshasa and Bolobo. Belgian aviators covered a distance of 200 miles in a little over two and a half hours.

A New High-Lift Wing known as the "Aulula" wing is now attracting wide attention among British airmen. The wing is the result of some eight or nine years' patient research work on small-scale and full-scale models. All these experiments have been directed toward producing a wing with high lifting power and low head resistance. It is claimed that the new wing eliminates all "end losses" and leakage which reduce the efficiency of other wings and waste energy in vortices. It is this feature which makes for an enormously high percentage of actual lifting power.

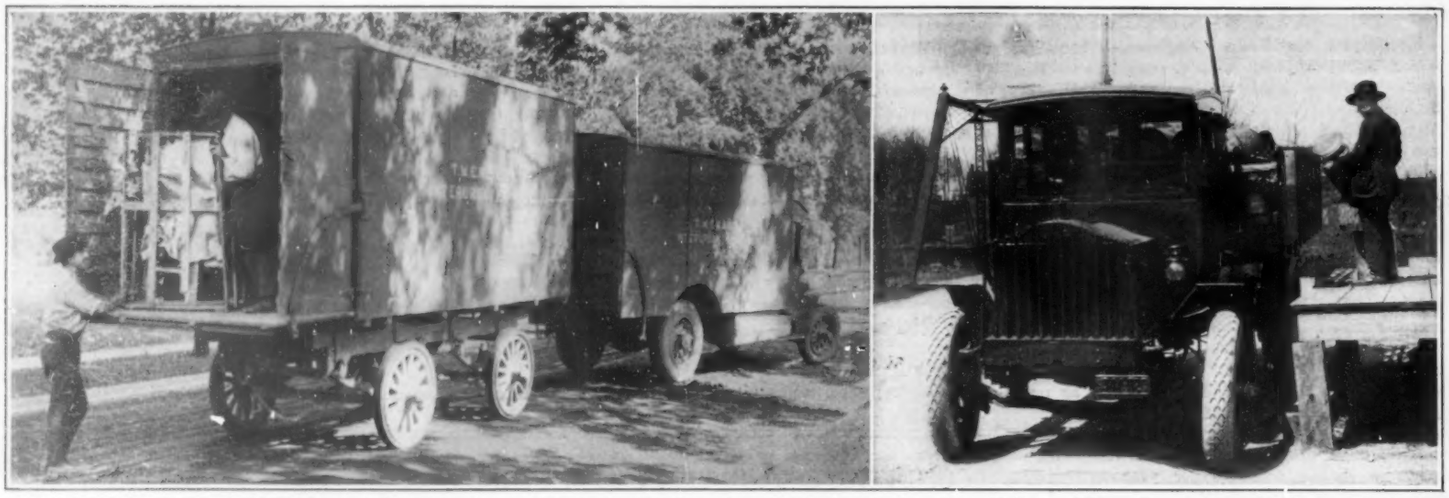
American-Built Junkers Monoplanes.—From advertisements which have recently appeared in the aeronautical press, it is learned that the Junkers all-metal monoplane is to be constructed in the United States at an early date. It will be known as the J.L.-6, and built under a patent license granted by Dr. Hugo Junkers of Germany. It is claimed that the machine will carry six to eight passengers at an average speed of 112 miles per hour with a 160-horse-power engine.

An American Torpedo Plane.—Carrying a crew of four men and a 1,000-pound torpedo, a Martin bombing plane fitted with torpedo gears recently flew from Washington to Yorktown, Va., a distance of 125 miles, in 64 minutes. Naval officers declare the flight established a record for planes of that type. The flight, continues *Aerial Age Weekly*, was made as a test of the Martin plane in connection with its use in the bombing and torpedo practice soon to be conducted with the old battleship "Indiana" as a target.

Smoke Screens from Air Bombs.—Tests conducted by representatives of the Bureau of Ordnance, Navy Department, with smoke bombs designed to lay a smoke screen for naval vessels from aircraft, proved that a satisfactory screen can be laid in this manner. Experimental models of smoke bombs weighing 50 pounds were tested recently, and after the experiments it was agreed that a bomb weighing not less than 100 pounds would prove to be more satisfactory for the purpose for which the experimental models had been designed.

Timber Land Inspections by Airplane.—Traveling 200 miles in 144 minutes, part of the time circling low to note the destruction done by forest fires in the Yakima district, Washington, Aviator R. I. Ehrlichman of a local lumber company, accompanied by the vice-president of the company, recently inspected the timber holdings of his organization by airplane. The aerial inspection is reported to be a highly satisfactory means of making a rapid yet sufficiently complete survey of timber holdings.

Zeppelin Activities.—A few weeks ago Germany delivered a brand new Zeppelin, the largest yet built, to France and another new Zeppelin to Great Britain. Yet we are told by *The Aeroplane* that Herr Colsmann, the director-general of the Zeppelin interests, recently returned from the United States after negotiating with certain firms regarding transatlantic air traffic. Negotiations have also been carried on with Holland, Sweden, and the United States for the construction of airships on an international basis. It is rumored that a new type Zeppelin airship, with a load capacity of 60 tons, accommodation for 500 passengers and fuel capacity for a voyage three times the length of the Atlantic crossing, is to be evolved.



Left: This interurban express line running out of Milwaukee makes use of the truck and trailer system. The service extends as far as Madison and Beaver Dam, and is said to be operating at 100 per cent capacity in picking up and delivering package freight of all kinds to farmers along the route. *Right:* A truck of a Detroit milk company making the rounds of the rural districts. Over half of Detroit's milk supply is now being brought in by motor truck

Two instances of how the motor truck is filling a very important gap in the Nation's transportation system

A New Deal in Transportation

Relieving the Railroad of the Business Which It Is Least Able to Handle

By Col. Jesse G. Vincent, Vice-Pres. Packard Motor Car Co.

WE have reached the point where congestion of terminals and tracks has begun to apply the law of diminishing returns to railroad freight traffic. The situation is greatly aggravated by the immense shortage in freight cars. Together, these have brought about a partial failure in our transportation system that is causing great loss—loss to the roads themselves, particularly in short-haul, less-than-carload freight, loss to the shippers, and loss to the general public by reason of the increased cost of living and the impossibility of delivering products promptly at the point where they are needed.

Into this situation the motor truck is coming as a means of salvation. It is only a few years old, and has been fitted for its task even more recently, through the grueling strains suddenly put upon it during the World War. Although it is barely beginning to serve, it has proved itself possessed of the power to save money for the public, the shipper and the railroads at one stroke, besides solving the transportation tangle by lifting the burden which presses most heavily on the railroads, that of short-haul, less-than-carload freight.

A more or less permanent shortage of 100,000 freight cars which has existed for several years back puts additional stress on every discussion of this new movement in the transporting of the country's freight. And little promise is held forth for early relief from this serious freight car shortage. According to *Railway Age*, there will be needed in this country during the next three years, if provision is to be made for the inevitable growth of shipping and the retirement of worn-out equipment, a total of 712,400 new freight cars, not to mention locomotives, signal apparatus, track maintenance material and sundry other rail supplies in similar quantities.

Many trustworthy authorities contend that it will be utterly impossible to construct this large amount of new equipment rapidly enough to satisfy the shipper's needs. Surely, the contention is not far from logical if we may take as a criterion by which future production may be predicted, the freight car output for 1918, computed from statistics of the Railway Administration, which show that during this year deliveries were made on an order for 100,000 new freight cars at the rate of only 61,000 units per year.

The seriousness of the situation and the tremendous cost to both the shippers and to the public are at once apparent. The harmful influences of congestion reach into every producing center in the country. A prompt turn-over of freight is out of the question. Consequently, excessive credits are required to carry the burden of distribution through its cycle. Production is severely crippled through the lack of raw materials and as a direct result of this prices are increased.

All of these things arise from inadequate transportation and must be corrected before the country can return to a normal condition so far as the movement of freight is concerned. Some of this improvement will come naturally through the reorganization of the railroads, but it cannot all come from these quarters. Those who study traffic conditions closely are beginning to realize that no amount of expansion beyond a certain economic point can be of any profit, either to the railroads, to the shippers or to the public. Their deduction is based upon a law that heretofore has not been applied to railroad traffic, being confined solely to production problems. The law is known as the law of diminishing returns.

At first glance, any presumption that the motor truck as a means of moving the country's freight will meet its greatest opportunity after a given section of the country is so thoroughly developed from the railroad standpoint that no further advances are possible, seems grossly inconsistent; but, as a matter of fact, something of this kind is very liable to come about. Judging from conditions as they exist in the crowded eastern and northern States, this law of diminishing returns is beginning to operate.

The industrial section of the country, lying to the north of the Ohio River and extending eastward to the Atlantic, has been described as being literally nothing more than a huge switch yard in which the routine of keeping freight moving rapidly and of administering the countless details of short hauls and numerous transfers or trans-shipments, is becoming more and more difficult as time goes on. In this part of the country, a railroad report for a month in 1917 showed, under the stress of war-time production, the average daily freight car mileage of 25 miles was reduced to but 18 miles.

Undoubtedly there is a certain point in the expansion of railroads where such a penalty is paid. Obviously it does not apply to all localities, but there is no question but that it does find favorable soil in the crowded north-east territory, where the railroad has had the greatest growth in answer to the ever increasing industrial growth of the surrounding country.

The most significant fact of all is that so far as transportation experts can see at the present time, the law of diminishing returns creates a permanent barrier which the railroads will never, for simply physical reasons, be able to surmount. The more the trackage and the larger the number of terminals, the more the congestion will be aggravated and the slower the movement of freight will be.

So far as the money-making ability of the railroads goes, it will not be hampered in the least by a far wider adoption of motor trucks; for these motor trucks in practically every instance will be handling freight which could not be accepted at a profit by the railroads.

For many years, less-than-carload freight has been a skeleton in the railroads' closet and a very real cloud over the profit and loss sheets. Less-than-carload freight has never been catered to by the railroads. They have never been slow to realize the impossibility of securing an adequate profit on shipments which involve one or more transfers, with trucking and handling charges incidental thereto, before delivery to the consignee can be made.

Profits to the railroads come from long, uninterrupted hauls, such as those far-sighted pioneers of the Hill and Harriman school prepared for when they laid lines through the desert wastes of the West to reach the active Pacific Coast region.

One very definite advantage that will come to the railroads themselves through the increased use of trucks in handling short-haul freight, will be in connection with what are known as "feeders." These short lines are almost all of them unprofitable and many are able to subsist only through charging extremely high freight rates. They are intended for no other purpose than to bring in, to the trunk lines, freight that will prove profitable on long hauls; and this long haul freight, therefore, has to bear the burden of an actual loss to cover transportation over the "feeders."

Truck lines will almost certainly in due time take the place of the "feeder" roads with benefit to all concerned. They will, in almost every case, reduce the cost of freight and they will give a more flexible service. They also are infinitely below the cost of even the lightest branch railway for installation and they can be put in at thousands of points where it

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ONE of the most satisfying things about the progress of applied science is the way it has of always producing, as though from a conjurer's hat, the exact appliance that civilization needs at just the moment when the need appears. History is full of the stories of sudden developments of new inventions in a way that appears almost miraculous until a study of conditions shows that the world was exactly ready and waiting for the particular invention in question. We are today witnessing the beginning of just such a development in the transportation field, in the entrance of the motor truck into the short-haul business. This is a story that is more or less familiar to most of us, but few of us will fail to find food for reflection in Col. Vincent's treatment.
—THE EDITOR.

Applying Radium to Cure Man's Ills

By H. A. Mount

THERE has been much popular interest recently in the purchase by the State of New York of two and a quarter grams of radium for use in medical research work. Aside from being the largest single transaction in the precious material ever recorded, the sale price being $225,000, the incident holds a vital interest to thousands of sufferers from cancer and other malignant diseases, for the radium is to be used largely in fighting this dreaded malady.

Every year in the United States approximately ninety thousand persons die of cancer, the second disease in deadliness. Radium has long been used successfully in fighting cancer and similar malignant conditions, such as tumors, and for treating growths of a benign nature, including the removal of birthmarks. Radium has also been used in the treatment of rheumatism and neuralgia and for diseases of the kidneys and liver and certain disorderly conditions of the digestive tract.

At the left is the lead case in which the radium is carried. Below is a plaque for applying radium to skin and surface afflictions. The round disks are metal screens. At the right is an applicator, dissembled, with screens. At the extreme right the insertion of an applicator into a screen is shown

How the medical profession makes use of radium as a tool in curing human ills

The interest of the ordinary individual in radium is matched by a profound ignorance of how it is used in medicine and perhaps a brief exposition of methods will not be amiss at this time. There is nothing particularly new in the facts recorded here. The man who wishes to go more deeply into the subject will find many books on the therapeutics of radium in the libraries. There has been no important widening of the field of usefulness of radium in medicine in recent years, but the technique of its use has improved wonderfully and the results today are far more valuable than a few years ago. It is in this connection that the purchase by New York State is expected to be of especial value.

Radium, as used in the hospital, is not a medicine or a "cure." It is a tool—just as much a tool as the surgeon's knife; and it requires just as much skill and knowledge to use it successfully.

It is a matter of common scientific knowledge that radium emits three kinds of "rays," designated as Alpha, Beta and Gamma rays. The Alpha rays, which compose about 85 per cent of the total, have very little penetration. A sheet of tissue paper will stop them. The Beta rays, composing 10 per cent of the total, will penetrate about 35 millimeters of lead. Both of these are not really "rays," but emanations from the radium itself. They are tiny particles shot out at terrific speed and force, the fastest traveling at about one-fifteenth the speed of light. The third "ray," the Gamma, is really a "ray" or vibration similar in action and effect to the X-ray, excepting that the wave is shorter and "harder." It travels with about the speed of light. It is this Gamma ray which is useful in surgery.

It has been found that this ray has the effect of destroying, or dissolving, useless tissue exposed to it. Good tissue has a much greater resistance to its effects, usually being about a fourth as susceptible to the rays as useless tissue. After the first exposure to the rays, even useless tissue, however, builds up a resistance to the effects. It is the object of the physician, therefore, to expose the part to be treated to a maximum intensity for the longest time possible without affecting the good tissue.

There is no pain or other effect immediately noticeable from the exposure. But if the treatment has been effective, the growth will gradually disappear in time which may vary from a few weeks to several months, depending upon the nature of the growth and the physical condition of the patient. Subsequent exposures may be made but the first is depended upon to accomplish the principal result.

By means of the electroscope it is possible to measure to a very fine degree the strength of the radium "rays." The rays, of course, are always constant and this represents a distinct advantage over X-rays, which may fluctuate in volume.

The amount of the "dose" can be accurately gaged by determining the size and location of the tissue to be treated, the distance from the spot the radium is to be held, and the nature and thickness of "screens" which are placed between the radium and the flesh.

The usual method of application is to place the little

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Putting Paper on a Specification Basis

By G. H. Dacy

AT present the paper question is one of the paramount issues of the day with the most critical news print shortage ever experienced. Everywhere throughout the country advertising is being curtailed to the minimum point while all news material which is not of vital importance is being reduced to the smallest possible space in order that the available paper stocks may be conserved. In view of the paper economy campaign which is being preached and practised rigorously and well, the official data determined by the Federal Government in its various paper making and handling operations are of special interest at this time.

Annually the various government departments use approximately 50,000 tons of paper and in order to insure that this huge volume of paper corresponds in every respect to the specifications according to which it was purchased, Uncle Sam submits the stocks to many scientific and accurate efficiency tests. The paper is subjected to many physical and chemical tests as well as micro-analysis.

By means of the chemical tests it is possible to ascertain accurately the amount of resin sizing that is in the paper and the amount of filler and loading which has been added to give the paper bulk, capacity, finish and surface. The physical tests permit of determining definitely the weight, thickness and bursting strength as well as the folding endurance and tensile strength of each variety of paper which is tested. Last year, the Bureau of Standards, which performs the paper testing activities for the Federal Government, subjected 5,000 samples of paper to 19,545 official tests.

The "sizing" of the paper is the property which makes it possible to write upon it with ink. The methods now in use for determining the sizing of paper stock are not very satisfactory from a laboratory or mill-control standpoint and, on this account, Uncle Sam's scientists are now busy trying to devise more satisfactory tests. Furthermore all the available apparatus for ascertaining the bursting, tearing and tensile strength of paper are under investigation by careful and experienced experts so that they may, as far as possible, standardize the paper testing situation.

The Bureau of Standards has installed a miniature but complete paper mill on which it has tested out various fibers, weeds and grasses for paper making. The indications are, from the results thus far obtained, that wood pulp is the most dependable source of paper as various economical factors operate in one way or

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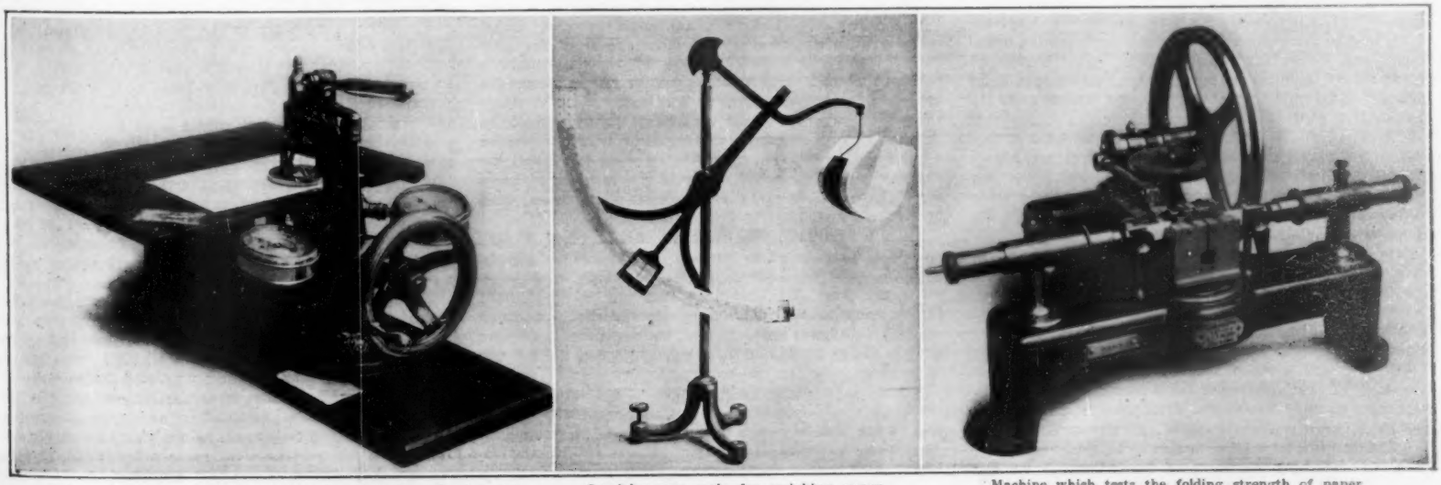

This machine is invaluable for testing bursting strength of paper

Special paper scale for weighing paper

Machine which tests the folding strength of paper

Three machines which serve to check up on the printing quality and wearing properties of paper

What About Our Wheat Production?

A Concrete Suggestion as to How We May Produce More by Producing Less

By H. A. Crafts

THESE are times that demand the consideration of vital questions only. And at this time, as always, there is a paramount vital question.

What is the paramount vital question of today? It is not war, because wars of any great magnitude are over for many years to come. Wars being over, peace comes automatically, regardless of diplomacy or parliamentarism.

The Great War has been over for nearly two years now, and parliaments and peace conferences have been laboring night and day at the framing up of a paper peace, yet they have so far failed to reach an agreement that they have been able to put into effect. Yet comparative peace reigns throughout the world today. And here we have a shining example of the superiority of physical forces to moral forces.

If we search a little we shall discover that our paramount vital issue lies, not within the realm of politics, but within the domain of economics. And within the domain of economics we find the matter of human subsistence looming above all others.

The world's food supply must be the first great problem to be solved. If the law of supply and demand still endures in the commercial world the very high cost of living of today should go to prove that the world's food supply is far below the normal demand. In our own country there exists a condition of apparent plenty, yet food prices are exceedingly high. In Europe incipient famine and exorbitant food prices go hand in hand.

What are the chances of overcoming this overshadowing world menace? It is very probable that we have not acquired an adequate conception of the frightful condition of physical, moral and financial exhaustion that Europe was left in at the time of the signing of the armistice. And even Europe's remaining strength is being taxed by revolutions, and counter revolutions. Even in pre-war times Europe fell far short of producing her own food supply; then how much less able is she today to feed her own people than before the fateful day of August 4th, 1914!

Upon whom then will fall the burden of making up this appalling deficiency in the world's food supply? Upon us of the United States, and upon almost none other. We have already sustained enormous sacrifices in stricken Europe's behalf, yet the end is not. We must go on, and on in this work of world philanthropy; yet at the same time we must safeguard our own interest.

Europe saw fit to plunge headlong into a fratricidal conflict, and must expect to suffer the awful consequences of her mistake; yet we must not stand aloof and see her utterly perish, and the innocent suffer the pangs of hunger. Then how about our own ability to cope with this vast and vital problem?

The whole onus lies with the American farmer. The individual farmer may do much of his own volition. But it appears to me to be more a question of farm policy. New cultural methods may be introduced and be of large value. But more important than all is general enlightenment, coördination of economic and intellectual forces, and coöperation in the field of general effort.

The American farmer has various obstacles in his way, among which are a shortage of farm help, antiquated methods, and soil impoverishment. On the other hand a careful survey of conditions will show that there are certain phases of the industry that are of an encouraging nature.

One of these is the invention and introduction of an entirely new order of farm machinery; the general supplementing of animal power by gas power, etc. Such a power has already begun, and is working with a tremendous impulse. Its possibilities rise before the mind's eye to stupendous heights.

But of equal, if not of more, importance is the refertilization of our cultivated farm areas, which for the past half century have been drawn upon almost without limit, with no compensating return to the soil of fertilizing material. How is this to be done? The use of stable manure, commercial fertilizers, or of any other class of ordinary fertilizer, is out of the question. These materials as fertilizers are on a par with the old farm horse and plow, as compared with a modern farm tractor. We must get back to nature.

What are the elements that make fertile our virgin forest clearings, our plains and delta lands? Why, the falling leaf, the withering grass, and the profuse rootage of growing forests and verdant plains, forming that element we call the turf, and these in their decayed or incinerated state.

Why do not our forests languish and our plains become sandy deserts? Because in Nature's great system of economy they manure themselves with their own substances.

But of course there are other aids to natural growth; the sunshine, the wind, the rain, and various other phenomena. All of these are also available for the nourishment of cultivated growing crops. Therefore it is the farmer's duty to follow the example of Nature, and make his land manure itself.

This must be done by methods already known to most farmers, and practised by many. The art of green manuring, and of the scientific rotation of crops, to my thinking may be easily made to bring about the solution of this most momentous problem.

To emphasize the stern necessity of instituting this reform in our agricultural methods it is only necessary to cite the history of a single cereal—wheat. Wheat as the world's principal bread material had its acid test in the recent food shortage in Europe. We gave up a portion of our white bread, and ate various kinds of war bread, that our allies across the water might not be deprived of their wheat bread. We swallowed it with Spartan hardihood—this war bread, part barley, or rye, or corn, or rice, but when the old pure white loaf came back again it filled our hearts with rejoicing.

THE exhaustion of the world's wheat fields and the moving of the wheat grower on to new territory is an old story. But it seems that he cannot move on forever without coming to a jumping-off place; and the performance of the past few years would indicate that just at a moment when the world's need for bumper wheat crops is most acute, this jumping-off place comes in evidence. It is therefore in order to ask what else we can do, to increase wheat production, than abandon the old fields and pass on to new. One answer may lie in the direction of farming on a sufficiently intelligent basis to prevent the soil from being exhausted of the elements that make for wheat production. Mr. Crafts puts forward two very concrete suggestions as to how this might be done, and at the same time makes properly clear the general principle on which both these suggestions rest.—THE EDITOR.

Wheat is the premier bread cereal of the world, and stands today fixed and firm upon its economic pedestal. What is the United States doing in the way of producing this supreme bread material?

It is not the aggregate yield of the country that we must look at, but rather the yield per acre. Under war urgency the country produced about one billion bushels of wheat in 1918. But if the yield per acre for that year were sought it would doubtless make a poorer showing than in any year in the country's recent history. In California, for instance, there were thousands of acres sown to wheat that produced no harvest at all, by reason of severe drouth. And these acres must be counted in when we come to reckon the average yield per acre; for it is the number of acres sown that must be taken as the basis of reckoning, and not the number of acres harvested.

Then let us take the country's wheat crop of 1916 as being the nearest to normal. The acreage is given as 52,785,000; total yield, 639,886,000 bushels; average yield per acre 12.1 bushels. This places the United States even below reactionary Russia in its average wheat yield per acre, a sad commentary upon the progressiveness of our country, supposed to be the most progressive in the world.

But when we take up the cases of individual States the showing is even worse. Let us consider the average yields of wheat per acre of some of the supposed great wheat producing States for 1916: North Dawota, 5.5 bushels; Minnesota, 7.4 bushels; South Dakota, 6.8; Kansas, 12; Missouri, 8.5; and so on.

The States showing the best yields of wheat for that year, strange to say, were come of those New England and Middle States, whose agriculture is supposed to be in a moribund condition. Maine's average yield per acre was 27 bushels; Vermont's, 25 bushels; New Jersey's, 20 bushels; New York's, 21 bushels. So it seems that the culpability, if such it be, lies with the great West, supposed to be the store-house of the nation. And all this is due to an almost total disregard for one of the great fundamental principles of sound agriculture—refertilization. How about the remedy for this menacing evil?

Two examples that have come under my personal observation will suffice as finger-boards, pointing the way to reform in our agricultural methods.

For a period of twenty-three years I was a resident of northern Colorado, and observed quite closely the evolution of farming methods in that section. First there developed a great system of irrigation, which, coupled with an extremely fertile soil, opened a rich field for agricultural enterprise. At first the almost universal crop raised was wheat; because there was a great mining state round about which was drawing a large influx of settlers from all over the world, demanding a commensurate food supply. Railroad tariffs from the Missouri River were high, and this acted as a protection to the Colorado farmers. Colorado wheat struck a level of two cents per pound, and maintained it for a number of years.

The new lands, under the combined influence of fertile soils, ample water supply and a favorable climate produced wonderful crops of wheat—say from forty to sixty bushels to the acre. The farmers got rich. But they made the fatal mistake of following a course of blind opportunism. They sowed their fields to wheat year after year, with no rest, no manuring, no rotation of crops. The yield of wheat per acre dwindled from year to year until the average was only about eighteen bushels to the acre.

Meantime competing lines of railroad flung their tracks of steel across the great plains and railroad freight rates melted away beneath the hammering of rival lines. Wheat fell to a cent and a quarter per pound, and the farmers got poor. Some "pulled up stakes," and pushed on over the divide to Oregon; others stuck it out. Then the question arose as to what the Colorado farmers could raise, and make a profit.

A certain dealer in flour, feed and seed in Fort Collins had heard about alfalfa and its wonderful properties as a forage crop. So he sent to Los Angeles for a sack of alfalfa seed. It happened that this dealer was the owner of a ranch near town, and there he took his sack of alfalfa seed, and tried it out on his own account. It produced beyond anything that he had dreamed of.

His fellow ranchers, without knowing just how they could dispose of alfalfa at a profit, even should they produce it, began to plow up their run-out wheat fields and sowing them to the new forage plant. In a few years the country round about became green with alfalfa verdure, and literally loaded with alfalfa hay in barn and stack. But there was no special demand for the product, so the farmers began to plow under their alfalfa and to try wheat once more.

And behold! The wheat produced unexpected stands; in fact it grew so rank that it "lodged," or "fell down," to use some common farm phrases. So the farmers were compelled to plant some less susceptible crop on their alfalfa lands for a year or two; such crops as potatoes, sugar beets. Then wheat was tried again and it went back to the old virgin yields, and some better.

Naturally it became the desire to continue the growing of a crop that would produce from seven to nine tons of hay to the acre in a single season and at the same time enrich the land upon which it was grown.

By a mere accident again a way was discovered—the feeding of spring lambs from the ranges, for the Chicago market, upon alfalfa hay and corn shipped in from Kansas and Nebraska. Here was an entirely new industry that soon grew to large proportions, it being no uncommon thing to see half a million head of lambs fed around a single farming section in a single season.

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Why We Need a Separate Trade-Mark Bureau

Growth in Use and Popularity That Demand a Greater Degree of Specialized Federal Oversight

By Chauncey P. Carter

IT is a fact little appreciated by those most interested that patents are granted by virtue of a specific constitutional provision authorizing Congress to secure "for limited times to authors and inventors the exclusive right to their respective writings and discoveries," while the right to exclusive use of a particular trade-mark is acquired by use, is unlimited in duration and is of interest to and may be registered by the Federal Government only if such use extends into interstate or foreign commerce and thus brings the mark into the purview of another constitutional provision giving Congress general authority over interstate and foreign commerce.

Patent rights and copyrights, therefore, are obtained by virtue of contracts between the inventors or authors and the Government wherein the former agree to disclose and do disclose their discoveries or writings in return for the grant of and protection in the exclusive right therein for a limited period after which they shall become public property.

The exclusive right to use a certain trade-mark to identify a certain kind of goods, on the other hand, is not granted by the Government in this country, but is acquired as a result of original use of such mark in connection with those goods just as a newsboy as a result of having been the first to do so, acquires an unwritten right to sell his papers on a certain corner, undisturbed by others. This is true not only in the United States, but also in England and in practically all countries where there is a "common law" consisting of court decisions as distinguished from those countries that are governed entirely by an approved code of laws and known as "code" countries. In most of the "code" countries, the right to the exclusive use of a particular trade-mark in connection with certain goods is not acquired by original use but must be obtained from the Government, which usually grants the same to the first applicant therefor, regardless of earlier use by another without such grant. In fact, it is a punishable offense in some "code" countries to use a trade-mark that has not been legally granted to the user.

Aside from these "code" countries, however, it will be seen that there is a fundamental difference between patent- and copy-rights on the one hand and trade-mark rights on the other hand, and even in the "code" countries this distinction is made: patent- and copyrights are limited in duration, while trade-mark rights are unlimited in duration although they are often subject to annual taxes or renewals for revenue purposes and to avoid "sleeping on one's rights."

Notwithstanding this fundamental difference, it seemed wise to certain of our early legislators to place the registration of claims for rights to exclusive use of trade-marks in interstate and foreign commerce in the same hands as had been placed the grant of patents. It is not at all improbable that this was a result of a misapprehension in the minds of these early legislators that the rights were fundamentally similar. Indeed, the first law providing for the Federal registration of trade-marks was soon after its enactment declared unconstitutional, because it was not limited to marks used in interstate or foreign commerce and, therefore, had no place to hang its hat in the Constitution.

However that may be, the Federal registration of trade-marks has always been and is still with the Patent Office. The proposed breaking up of the Department of the Interior and the substitution for it of a Department of Public Works bids fair to become an accomplished fact in the not too distant future. be accompanied by a giving up of the Patent Office to the Department of Commerce as a sort of "swap" for the Bureau of Standards. It therefore seems proper to inquire whether this "swap" might not well be accompanied by a breaking up of the Patent Office into two parts, one to grant patents and the other to register claims to rights in trade-marks, labels and prints. Such an inquiry would seem to be justified in any case by the great increase in the number of trade-mark registrations that has taken place since this task was entrusted to the Patent Office and by a comparison between the numbers of patents and trade-mark certificates issued then and now.

In the Report of the Commissioner of Patents to Congress for the year ended December 31, 1918, it is stated that trade-mark certificates were first issued in 1870 when there were 121 of them as compared with 13,333 letters patent during the same year. As compared with this, the Report of the Commissioner of Patents to the Secretary of the Interior for the fiscal year ended June 30, 1919, indicates that in that fiscal year 3,706 trade-mark certificates were issued as against 37,259 Letters Patent. In other words, there has been an increase of over 3,000 per cent in the registration of trade-marks as compared with an increase of less than 200 per cent in letters patent. Moreover, while of the patents and trade-mark certificates issued in 1870, trade-mark certificates formed less than one per cent, in 1919 they formed approximately ten per cent. In the fiscal year 1915, the year in which the majority of applications filed prior to the outbreak of the war were finally acted upon, the trade-mark certificates issued compared even more favorably with patents than in 1919.

Despite these facts, and despite the great difference between the merchandizing field, in which advertising and selling depend so heavily upon trade-marks, and the engineering and industrial field, in which patent rights are of such great importance, it is a fact still that one man, the under-salaried Commissioner of Patents, has the last word this side of the courts in both patent and trade-mark matters. Hence, it is not at all unusual, but is rather to be expected, that the Commissioner in a single morning shall be called upon to decide whether there is any invention in a device for

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Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

Ventilation of the Hudson River Tunnel

To the Editor of the SCIENTIFIC AMERICAN:

Readily admitting the necessity of vehicle tunnels under the Hudson River at Canal Street, there is the great importance of proper and ample ventilation without which the tunnels would be useless. The greater number of vehicles, probably 90 per cent, will be automobiles and motor trucks, exhaling poisonous gases. On this point the *Literary Digest* for August contains a very instructive article. It concludes with the warning that the contents of carbon monoxide (the most poisonous gas contained in the exhalations of motor vehicles) must not exceed the maximum of four parts in ten thousand parts of air. This conclusion has the endorsement of the United States Bureau of Mines, but the solution of the problem is left to the engineers of the Commission.

Although a novel problem, the principle of it is simple and easily understood. Fresh air enters through holes short distances apart from a fresh air duct, running the entire length of the tunnel. The amount of fresh air must be sufficient to dilute the poisonous gases at the required rate. Another duct, also running the entire length of the tunnel and also connecting with the tunnel through numerous holes, sucks up the contaminated air which is expelled through shafts at each end by mechanical blowers. The ventilation is thus crosswise to the tunnel and is a continuous operation that requires careful designing for its success.

Let us believe that the engineers of the Commission have thoroughly studied the problem, yet it is of such overwhelming importance that the details of that study should be published as proof thereof.

To mention only one point. The velocity of air and gases through the ducts will be very great. The friction along the walls of the duct and through the orifices will consume a great deal of power, which will increase rapidly as the walls of the ducts will become rough and incrustated from the dirt and dust in the air. The surfaces of the ducts will therefore require periodic inspection and cleaning similarly as chimneys require periodic cleaning from soot. To that end the height of the ducts should be sufficient for a man to walk through from end to end, 4,000 feet long. But the heights shown in the plans are only from one foot to four and one-half feet in the lower duct and from one foot to five feet in the upper duct. These heights are too low and would require continuous stooping of the workmen, which is both exhausting and tormenting in long, hot ducts. The upper grating seems hardly strong enough to bear the weight of any mechanical device or track for removing the dust.

Why is the fresh air duct placed at the bottom? Air coming up from the bottom will mix before being inhaled with the hot poisonous gases which are expelled at the bottom of motor vehicles. If the cool, pure air is admitted at the top then it can be inhaled *before* it mixes with the foul hot gases at the bottom, which should be instantly sucked up.

For the ducts to be sufficiently large, the diameter of tunnel should be increased from 29 feet to 32 feet. That would also give more width for the roadway and sidewalk and contribute to greater safety of workmen and policemen employed in the tunnel.

No shortsighted economy should expose the users of the tunnel to poisoning by insufficient ventilation. On this point the details of operation cannot be too specific and should be published. The Commission by meeting this justified request at this time would invite public confidence just when it is most needed for the referendum vote, authorizing the bonds to be issued for this work, which not unjustly is regarded as a huge and costly experiment.

MECHANICAL ENGINEER.

Wicker Weaving by Machine

To the Editor of the SCIENTIFIC AMERICAN:

Your issue of March 6th containing an article under the above title has been brought to the writer's attention. You have supplemented this article with editorial comments to the effect that the art of wicker weaving has been revolutionized. Evidently you are not aware of the fact that in spite of the invention you describe, wicker baby carriages are still woven exclusively by hand. In other words, the machine which you describe does not weave wicker but weaves an imitation of reed. Reed comes in strands about twenty feet long. The machine you describe feeds from a spool, and the writer has never yet seen a piece of material woven by this machine that was not made of fiber (twisted paper).

So the old art of weaving reed is hardly influenced by this machine. In order to be satisfied with a machine-woven carriage, the mother must be satisfied with a paper imitation of reed, and also must be satisfied with a monotonous sameness of design, as all of those scrolls, festoons and various designs which have been originated by reed workers to delight the eyes of the mother are impossible in the machine-woven carriage.

I have supplied these details for your information. At the same time I have had enough experience as an advertising man to realize that some press agent is entitled to congratulations on his success.

Elkhart, Ind. A. H. LORD.

The Dendrograph

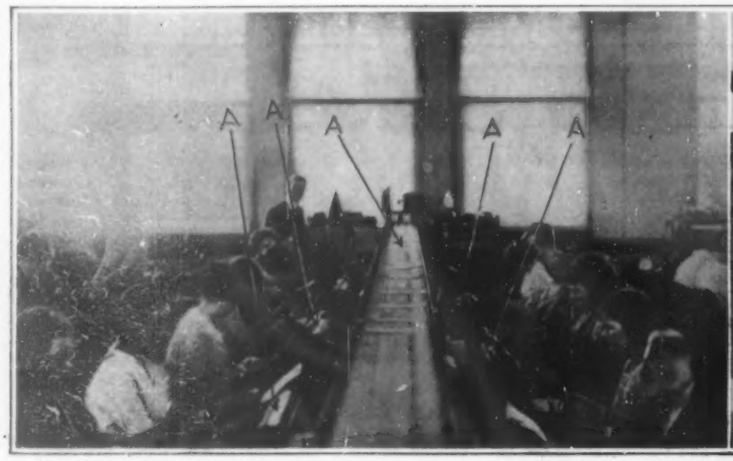
To the Editor of the SCIENTIFIC AMERICAN:

Referring to my description of the dendrograph in operation at the New York Botanical Garden published in the SCIENTIFIC AMERICAN for May 29, 1920, I will say that the article was written without due authorization.

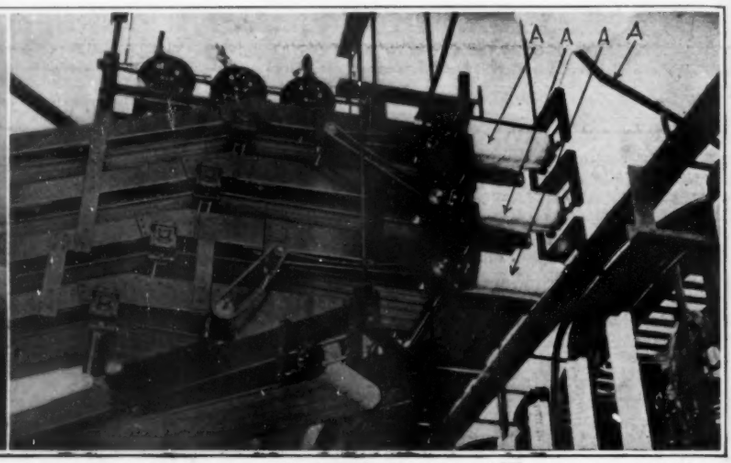
Dr. D. T. MacDougal of the Carnegie Institution of Washington, the designer, placed this working model in the hands of Dr. A. B. Stout of the New York Botanical Garden for testing, with the privilege of describing the seasonal growth of the tree to which it was attached in the Journal of the Garden.

The Department of Botanical Research of the Carnegie Institution of Washington proposes to defer publication of a technical description of the instrument until it has been perfected by the aid of results secured from trials now being conducted by collaborators in various parts of the country. W. A. MURRILL.

New York.



A corner of the receiving department, showing the automatic receiving machines and manner in which even the incoming messages are distributed by conveyor



A detail of the conveyor mechanism, making clear the manner in which the belts are able to negotiate a right-angled turn without losing their messages

Twentieth Century Telegraphy

The Big San Francisco Central Office, the Last Word in Equipment for Speed and Capacity

By Charles W. Geiger

WHAT is said to be the best equipped telegraph office in the world was recently placed in operation by the Western Union at San Francisco. Here all the innovations that experience has found to be desirable have been embodied and all features that experience has found to be undesirable have been eliminated. Standardization is now being carried to a point in the design and operation of these telegraph offices seldom seen in any industry.

The San Francisco office, which is the third largest in point of business transacted in the entire United States, handles approximately 2,500,000 messages per month, and due to the modern equipment and efficiency of operation, at least 2,400,000 of these messages are disposed of within ten minutes from the time they are received at the office.

The most striking feature of the new office, aside from the electrical and mechanical improvements, is the comprehensive system of automatic belt carriers which convey the telegrams to and from all parts of the great room. Thus, the greatest economy of time is effected in the handling of messages from the time they are received until they are on the wires.

This system consists of especially designed enclosed belt conveyors in front of every operator, along the center of the tables, conveying all messages entering the room to a central distributing center in a series of flumes.

Messages are received over the multiplex, the Morse, the telephone and by a pneumatic tube system leaving the city branch offices. The messages from these four sources are placed on the belt conveyors, which quickly deliver them to a slower moving belt in front of a line of young women, who sort them and place them on one of the four belt conveyors (according to their destination), to be conveyed to the transmitting operators. The maximum time in transit for messages around the room (which has an area of 10,000 sq. ft.) by means of these conveyors is 54 seconds with an average of 21 seconds.

A very ingenious method has been employed in carrying the conveyors across the main isle. This is done by double belts, both rising, and clasping the messages between them. This method is also employed in delivering the messages from the telephone room which is located on the floor below the main operating room.

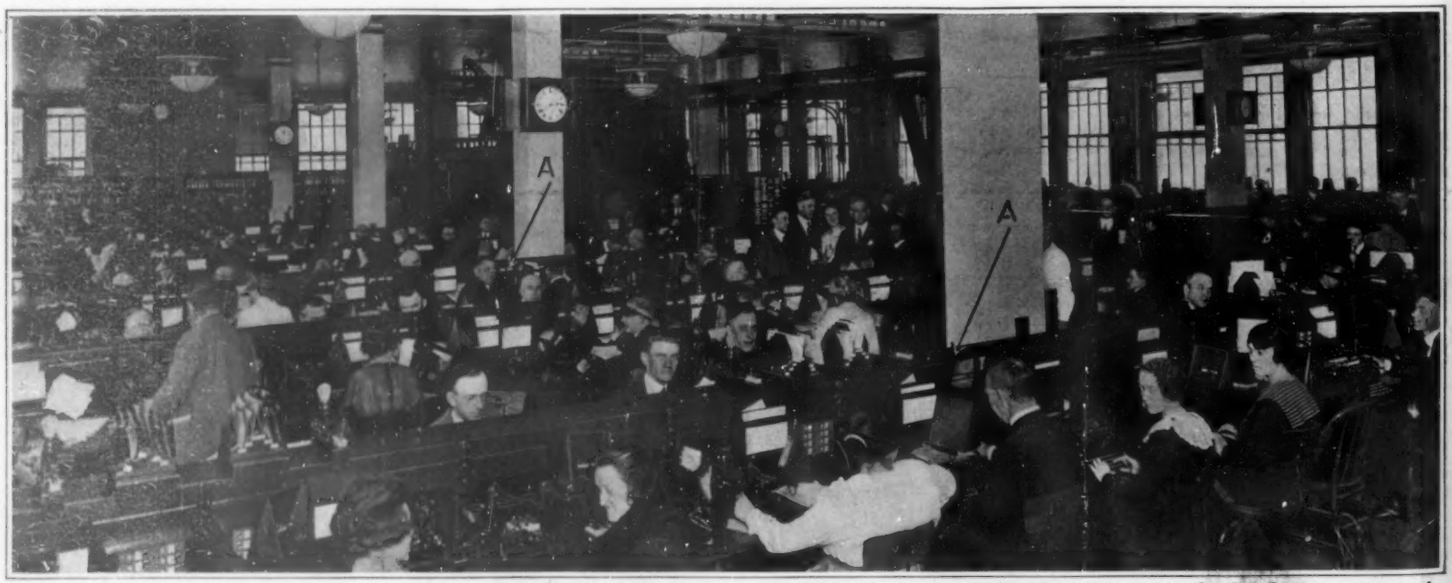
The belt conveyors travel 250 feet per minute, each belt being driven by its individual motor. In order to guard against the delay of a message in passing over these conveyors, two men are employed whose only duty consists in constantly going around the room, stopping each belt in turn for a few seconds, lifting it up, looking under it to see that no message has slipped out of place, testing it to see that it runs freely and then starting it again. As a further precaution, mirrors have been arranged for inspecting the elevated sections of the belt system.

By means of the multiplex, messages are being exchanged between San Francisco and New York within ten minutes every day. The messages are almost literally geared to the inexorable time schedule from the moment they enter the operating room until they have found the proper wires and their transmission has been completed. It is not merely possible but frequent that a telegram is filed at a branch office at San Francisco and received in New York within fifteen minutes. Over shorter distances—say, one thousand miles—the time averages much less, and seven minutes is the average time required for clearing messages to Los Angeles.

It is hardly possible to describe the multiplex system briefly yet satisfactorily. It is based on the idea of an automatic distribution or apportionment of the use of a single wire at intervals, to eight automatic machines, each busily engaged in sending a different message.

The intervals are so rapid that each machine transmits its impulse over the circuit to a corresponding receiving machine, and its turn comes again after the cycle has been completed, in time for it to pick up and send the next impulse without any apparent hesitation. All the impulses are, of course, of equal

(Continued from page 392)



General view of the San Francisco main telegraph office, showing (A, A) the conveyor flumes that carry all incoming messages to the distributing center, and out again to the proper operator

Making Sure of the Concrete Batch

A FIELD equipment for testing crushed stone and sand and clay aggregates, compact, light and capable of withstanding a certain amount of rough usage, has been developed by the United States Bureau of Public Roads, and is proving of great value, both in the plant and in the field or wherever aggregates must be tested for control work in construction and especially in inspection of highway materials.

A factor which probably tends more than any other to discourage adequate control testing of highway materials is the time usually required to send samples to a laboratory for test purposes. Even under the most favorable conditions several days may elapse before a report can be secured, during which time the lot of material represented by the sample must be held. Aggregates always are subject to variations in size, due to inefficiency in plant screenings and other causes, and yet may be intended for use in construction requiring uniformly graded aggregates.

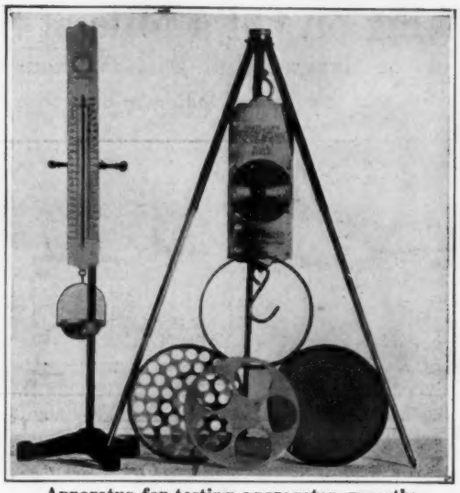
The field equipment consists of a set of interchangeable stone-screens, with screen plates having perforations, 3, 2½, 2, 1½, 1, ¾, ½, and ¼ inches in diameter; a set of interchangeable sand sieves of 10, 20, 30, 40, 50, 80, 100 and 200 mesh; a circular spring scale having a capacity of 30 pounds and sensitive to 0.1 of a pound; a straight spring balance having a capacity of 30 pounds and sensitive to 0.1 of a pound; a straight spring balance having a capacity of 200 grams and sensitive to 1 gram; a demountable cubic-foot box; an ordinary camera-folding tripod; a 250-cubic-centimeter graduate; a strip of screen wire about 22 inches in length and 5 inches high, and two canvas bags about 18 by 18 inches in size.

The interchangeable screen set consists of a number of perforated screen plates 8 inches in diameter, and two brass rings, one of which is provided with a narrow shoulder on the inside upon which a screen plate may be placed. The two rings are firmly clamped together so that the screen plate is held rigidly between them. This forms a screen of the same size and shape as the ordinary laboratory type.

The sand sieves are of the same general type as the screens, the various sieve plates fitting into the brass rings in the same manner. A sieve of any desired mesh may be made up by simply inserting the proper sieve plate in the lower ring and clamping it down by means of the upper ring.

The circular screen scale is supported by the tripod. The graduate is the only piece of glass in the outfit and is needed only when it is desired to make volumetric silt determinations. The circular loop of screen wire is used for making apparent specific gravity determinations of coarse aggregates. The strip is to increase the capacity of the screen, so that it may be used for weighing samples of sufficient size for this determination. It is rolled in the form of a loop and placed inside of the screen ring which in turn is suspended from the spring scales by means of three light wires.

The importance of the proper sampling of material in connection with the testing of aggregates cannot be over-emphasized. There are two points which must be borne in mind when sampling crushed stone and gravel aggregate. First, the sample must be representative of the entire quantity being examined; and second, it must be large enough so that the largest individual piece will in no case weigh more than 2 per cent of the weight of the entire sample.—By *R. Franklin Mundorff.*



Apparatus for testing aggregates, recently developed by the U. S. Bureau of Public Roads

Binder Twine from Florida

WITH more than 200,000,000 pounds of binder twine being used annually to harvest wheat, oats, rye and barley in the United States, a company in Florida has begun the cultivation of sisal and henequen fibers as a source of home supply, the product heretofore being imported from Yucatan. The American farmer expends approximately $20,000,000 for the twine used in tying into bundles about 100,000,000 acres of small grain yearly.

Previous attempts to grow binder-twine fiber in the United States have been unsuccessful. The Florida enterprise, however, is assured a fruition of its plans by 1922. The first crop, necessitating the cultivation of 1,000 acres, was begun in 1917, five years being required to grow the first crop. Southern Florida is the only place in this country where climate and soil are such as to encourage growth of the fiber-producing plants.

Sisal is a tropical plant, the maintenance of which cannot be insured where the temperature falls to the freezing point at any time, 50 degrees being preferable. The lowest temperature in Yucatan is 48 degrees. Among the soil requisites are a porous limestone land, and adequate drainage. For profitable results it should be grown on a plantation of at least 1,000 acres. It is estimated that the first crop in Florida will require a capital of $100,000 before it is brought to fruition. This computation includes cost of machinery, land and the clearing of the virgin territory. The Florida enterprise has acquired several thousand acres of land, located in the southern portion of the Everglades, in Dale County.

This country is threatened with a shortage of binder twine due to the two-fold factor of a decreased price of the product with the resultant effect of a decreased acreage in Yucatan. There are ten companies in the United States making fiber from the Yucatan-grown plant, one concern alone using annually 40 carloads of fiber. There is no practical method whereby the twine can be recovered once it is used in tying the bundles of grain, a fresh supply being demanded each harvesting season. It is a low-priced crop and cannot be grown on high-priced land, the yield of sisal not exceeding $100 an acre. American hemp as a substitute is too valuable and is not otherwise altogether satisfactory.

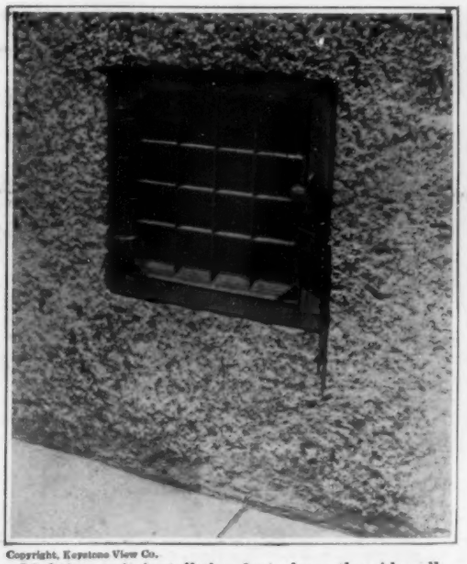
About 2½ pounds of twine is used for each acre of grain, with the exception of corn, which requirement is in excess of these figures.—By *S. R. Winters.*

Left: **Thrifty henequen plants cultivated in Cuba.** ***Right:*** **Bales of henequen fiber on their way from warehouses to pier in Yucatan, Mexico**

Putting the Street Lamps into Niches

THE huge Kensico Dam at Valhalla, N. Y., which forms part of the Catskill water supply system of New York City, is crowned by a broad roadway which is used by pedestrians and vehicular traffic alike in crossing the broad valley at that point. Hence one of the problems confronting the designer of the dam was the installation of some suitable lighting system for the roadway. At first the usual lamp post idea was suggested, of course using suitable lamp posts in keeping with the general appearance of the masonry construction. But on second thought it was decided that lamp posts of any sort would detract from the appearance of the dam, with its impressive flat top unmarred by any projections.

The final system of illumination adopted and installed on the Kensico Dam roadway consists of a large number of niches in the parapet walls, each containing a high power nitrogen-filled incandescent lamp behind a sheet of prismatic glass. A near view of one of these lighting units is shown in the accompanying illustration, which depicts how the prismatic glass and lamp are protected by a grillwork. The unit may be opened for inspection, cleaning, and the renewal of the bulb by opening the padlock. These units, placed at intervals of about fifteen feet, first on one side and then on the other side of the roadway, spread out their rays so that they virtually overlap, thus forming one sheet of light from one end to the other of the dam roadway. The effect is most pleasing, since the light is kept near the surface where it is needed, unlike the usual system of lighting.



Lighting unit installed a foot above the sidewalk along parapet roadway of Kensico Dam

Taking on Oil a Mile at Sea

How Vessels Receive Fuel at Mexican Gulf Ports Without Approaching the Docks

By James Anderson

AMERICAN efficiency has made oil one of the first requisites in the commercial life of our times. American initiative has uncovered many secret deposits of the fluid. American energy has brought it to the seaboard. Now as a fitting culmination American skill has devised a novel and most up-to-date system of loading it on ships a mile or more out at sea.

To those accustomed to think that the only way a vessel can be expeditiously loaded is to run her into some port, tie her up to a dock and then put a crew of stevedores to work placing the cargo snugly on board, the idea of loading a vessel well out to sea seems an impossibility. But that is just what is being done daily in Port Lobos and at several other points along the Mexican coast by a number of different American oil companies.

Beach end of the pipe line, completed and ready to start operations

Port Lobos, it will be recalled, came into the immediate limelight wherever oil was sold in the latter part of 1919. During the month of November of that year this port, the centre of that bleak stretch of windblown tropic shore that stretches from the mouth of the Panuco River at Tampico across some forty miles of coastal plain to the Gulf of Mexico, rolled up a monthly total of 2,000,000 barrels of oil. But not satisfied with this fact, Port Lobos is now seeking new laurels because it is there that the most satisfactory system of loading tankers that has ever been devised is being carried on.

TO those who are accustomed to think that the only way to load a vessel is to tie her up to a dock in some port and put a crew of stevedores to work, such a thing as loading ships while at sea would seem to be impossible, yet it is now being done daily and has proved the most satisfactory system of loading tankers yet devised. It is carried on by a number of different American oil companies in Port Lobos and at other points on the coast of the Gulf of Mexico. Just how it is accomplished and how successful it has already been proved to be is told in this story.—THE EDITOR.

The big ships stand a mile out in the open roadstead, pick up the buoyed end of a water-proofed pipe line, and through it suck in the oil until their bunkers are filled.

Along this stretch, occupied formerly by only pelicans and airgrettes, but now by wireless stations and those who produce the black liquid wealth from nature's storage tanks, powerful pumping stations dot the landscape. They bring oil from the wells far inland to store it in great tank farms from where they pump it through submarine feeding lines to tankers flying the flags of all nations. The work of loading these vessels through these submarine feeding pipes constitutes one of the most interesting experiments of the generation. While the process is practically new it has already proved a godsend to vessels which previously found it necessary to load with oil under the greatest difficulties, in ports that did not offer the proper facilities for docking and where there was the usual Mexican delay in awaiting pilots, custom officials, immigration inspectors, or doctors. Furthermore in following the new process of loading one has no harbor dues to pay, nor is there any danger of damaging small floating craft or wharfage construction.

As a first preliminary to the process of loading a vessel at sea with oil, two lines are laid on the ground for more than a mile back from shore connecting the pumping station with what are known as the sea lines. The sea-going pipes are painted with crude petroleum and then wrapped tightly in burlap. They then receive another heavy coating of crude oil, are once more wrapped in burlap, and again painted. All this is to assist the pipe in resisting the corrosion by salt water when it is under the sea. As an additional protection river clamps of wood about four feet in length are placed about every connection to prevent attack by the water at the joining. When ready the entire pipe is lifted to trucks on a narrow gage track in a straight line back from the shore. On the end that is to project into the sea a connection of 120 feet of 8-inch flexible rubber hose, heavily reinforced, carrying a securely closed nipple, is attached.

A sand sled, used to prevent the pipe from burying itself while being pulled to sea, is next placed under the front end of the line. A gasoline drum is tied on the top of the sled to keep the end of the line visible while being drawn out. Guiding blocks are then placed at either side of the line at its ocean end. Next a favorable day is awaited, when one of the tankers especially prepared for the purpose is moved into position to pull the line seaward.

Following these preparations the line is fastened to the tanker by means of a heavy cable. Then when all is in readiness the ship, light from lack of cargo, comes in as close as possible to the shore and then steers a straight course away from the beach to fixed mooring berths. The line moves seaward at the rate of about four miles an hour. As the trucks on which it is conveyed come to the end of the track they roll off on to tank plates and are removed from under the sea line.

Once the pipe lines begin to move seaward little time is lost in going ahead. In fact, from that point until the completion of the whole operation only about twenty minutes elapse. The operation must keep moving and once it gets started cannot be stopped, as the line would break of its own weight were an attempt made to pull it further after it had settled to the floor of the Gulf. Naturally it takes a great deal of skill and careful handling to pull one of these lines to sea successfully. Much of the credit for the success with which the operation is carried out should go to the managers.

The line laid to sea, connections are placed from it to the storage tanks, and the hose connection on the ocean end of the line is "marked" by means of a wooden float which is capable of carrying the weight of the hose.

Wherever the loading at sea takes place there you will see in readiness at all times numerous motor surf-boats. Each one is directed by what is called the mooring master. When a ship is announced, or is sighted, this surf boat is sent out to meet it. The mooring master boards the ship and takes full charge.

When the ship has been moored and

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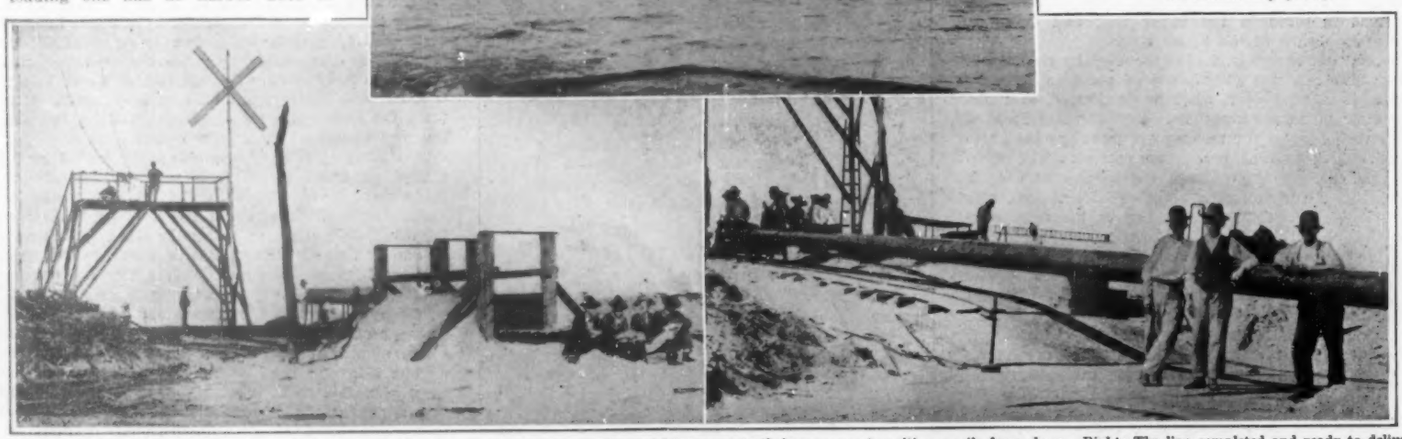
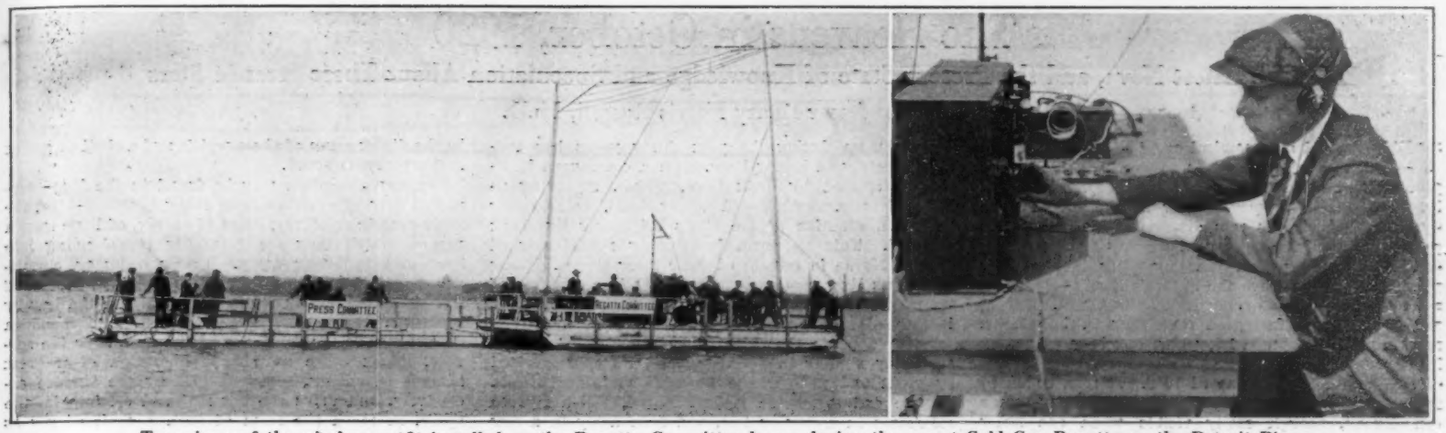


Left: The bridge from which the beach signal is operated. *Above:* Hauling the sea line and buoy out to their permanent position a mile from shore. *Right:* The line completed and ready to deliver oil to vessels far out beyond the surf

Some details of the pipe line with which ships are supplied with oil while standing a mile off shore



Two views of the wireless outfit installed on the Regatta Committee barge during the recent Gold Cup Regatta on the Detroit River

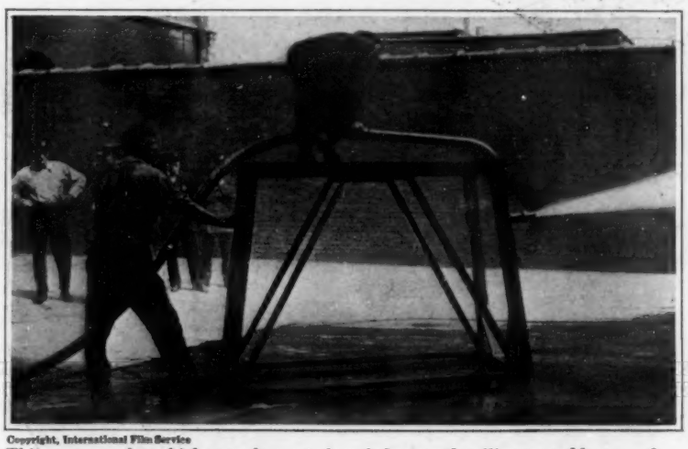
Using Wireless to Catch the Newspaper Edition

IN order to catch a certain edition, necessitating the rapid transmission of the results of the races, a Detroit newspaper made good use of wireless telegraphy during the Gold Cup Regatta, held recently on the Detroit River.

A short-range wireless transmitter and a conventional receiving set were installed aboard the Regatta Committee barge, as shown in the two accompanying views. A young radio amateur of Detroit handled the press dispatches aboard the barge and transmitted them some eight miles to the newspaper office in Detroit. Thus the results of the races were immediately conveyed to the editorial rooms, whereas, upward of an hour would have been required by means of a fast boat and the information could not be issued in the desired edition.

Simplifying the Fire-Fighters' Job

THE Chicago Fire Department has recently introduced a new form of nozzle for fighting flames from roofs and other elevated points, from which the streams of water are thrown more or less horizontally. The new nozzle, instead of being straight as is the usual equipment, has two bends as shown in the accompanying illustration. These bends are made so that the nozzle may be rested on the parapet or coping of a roof, balcony railing, fire escape, window ledge, or any other suitable object, thus taking the weight and strain off the fireman's hands. The nozzle then becomes a hinged nozzle, so to speak, which can be aimed in any direction and held in the desired position with little or no effort. By means of this nozzle several men are freed from nozzle duty and can devote their efforts in other directions.



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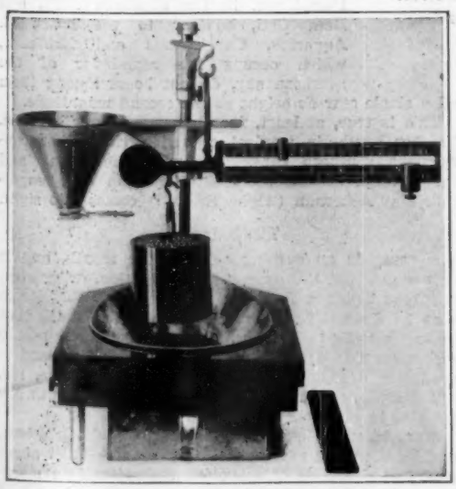
This new nozzle, which may be rested on ledges and railings, enables one fireman to handle a powerful stream of water

Speeding Up the Grading of Grain

TO expedite the efficient and accurate grading of wheat and allied small grains on the central markets, an ingenious device is used in measuring and weighing the different materials. Under normal conditions, it is difficult to fill a measure with exactly the same amount of grain from each sample and on this account a special appliance has been provided which delivers the grain by gravity into the measure that is standardized and used in keeping tab on the bulk and volume of the various samples.

A conical reservoir with a slide mouth is used for the initial reception of the grain sample to be weighed. When full this deposit is rotated until it is directly over a one quart measure which is attached to a compensating scale which is regulated so that it weighs only the grain. The slide at the bottom of the reservoir is then opened and the grain flows evenly and uniformly under the force of gravity into the measure. When it is full, the surface is struck properly and the amount of grain then remaining in the measure is weighed accurately on the scale which is designed to weigh in terms of pounds per bushel. It is thus easily possible to ascertain the exact amount of grain in each sample and whether it is under standard in weight due to the presence of shriveled and undersize grain; and accidental errors due to irregularity in packing the quart measure are brought down to a negligible minimum.



Weighing device used in sampling and grading grain

Conveying Molten Iron to the Molds

A NEW device for handling molten iron in a gray iron foundry has been invented by a Cleveland foundryman. It is in use in his own foundry and is a labor saving machine as well as a very efficient one. The device, as illustrated, consists essentially of a cylindrical ladle mounted on trunnions in such a way that the iron may be discharged through nozzles which become submerged when the ladle is rotated. The metal flows from the nozzles into two semi-circular guide troughs which convey it to the runners leading to the mold. The entire apparatus is carried on a frame mounted on wheels which render it readily portable.

The ends of the pouring basin are constructed of cast iron with a segment removed. The sides are made of heavy boiler plate perforated and securely riveted to the end castings. The inside of the basin is lined with one course of 1-inch fire brick. The basin is supported by trunnions which rest in sliding shoulders. The shoulders move in vertical guideways and are raised or lowered by an adjusting screw which is operated by a hand wheel. By this arrangement, the level of the pouring basin may be maintained and any depression in the track will have no effect on the iron level if the trunnion shoulders are adjusted. The rotary motion of the basin is controlled by a lever securely bolted to the trunnion flange on the operator's side of the machine. An extension arm carrying a counterweight is provided; this offsets danger of the basin's turning over of its own accord while the iron is being poured into it from the crane ladle. Two cast-iron guide troughs rest upon the side frames and may be lifted off when it becomes necessary to reline them with clay. A one-inch opening through which the iron flows to the sprues is provided in the bottom of each trough. The distance from the floor to the bottom of the basin is 3 feet 2 inches.

The entire device is supported by three flanged wheels—two on the operator's side and one on the helper's side—which run on rails spaced 4½ feet apart and permit the machine to be moved in a straight course over the molds. When several rows of molds are to be poured the machine may either be moved from one row to another by a traveling crane, or run to the end of the track and wheeled to the adjacent row of molds, for which purpose a lifting device is provided. It is said that two machines will take care of the output of a cupola which melts between 18 and 20 tons per hour and that only four men are required. Bull ladles required 14 men.

Molten iron can be carried in and poured from this straddle truck

The Heavens in October, 1920

The Latest Nova, and the Present State of Knowledge and Speculation About These Strange Stars

By Professor Henry Norris Russell, Ph.D.

THE principal astronomical event of the past month —announced just too late to find mention in the preceding of these articles—was the appearance of a bright Nova or temporary star in the constellation Cygnus. This object was discovered by Durning, a prominent English observer of meteors and planetary detail—on August 21st, the day after last month's "Heavens" had to leave the author's hands—as a conspicuous naked eye star, north of Delta Cygni. During the next day it increased somewhat in brightness, reaching the magnitude 1.9, which has been surpassed by only two Novae in the past century, Nova Persei of 1901 and Nova Aquilae of 1918. It then began to fade rapidly, and by September 1st was no longer conspicuous, though easily visible when one knew where to look for it. At the date of writing it is barely visible on a clear dark night without telescopic aid.

The Harvard photographic plates show that the star was exceedingly faint, if not invisible, a week before its discovery. The rise to maximum was slower than is usual with Novae, and the initial stages of the fall rather more rapid than ordinarily. Apart from this, the outburst appears to be typical. The spectrum, while the star was increasing in brightness, showed, as in other cases, dark lines only, and was generally similar to that of Altair (A5 in the Harvard classification). As the light passed to maximum the characteristic wide bright bands, with dark lines on the side toward the violet, made their appearance. Like other Novae, too, the star is in the Milky Way and not far from its central line.

How much additional information this star will give us regarding the nature of the processes which produced the tremendous outburst it is too early to say, but meanwhile, other information bearing on the problem has come in from different directions. A curious variable star T Pyxidis was discovered seven years ago by Miss Leavitt, on Harvard photographs. Usually it is very faint, of about the 14th magnitude; but in May, 1890, it rose in a few weeks almost to the 7th, and again in May, 1902, it repeated the change, falling off once more in brightness very much after the fashion of a "new star." No photographs of its spectrum were obtained during either of these maxima, which it is interesting to note took place eleven and twenty-three years before the discovery of the variability. But in 1920 the star blazed up a third time, and the spectrum was photographed and found to be of the characteristic Nova type. It is in 9h. 0m. R. A. and 32° south declination, close to the Milky Way; and on the basis of the observations of 1920 alone, the star would undoubtedly have been classified as a Nova. The fact that it has been known to brighten up twice before appears to be no reason why we should change our opinion. Most Novae, it is true, have exhibited but one great maximum. But several, including the bright Nova Aurigae of 1892, and two fainter ones recently observed in Ophiuchus, have fallen off in light, sometimes greatly, and then come up again, though before the earlier outbreak was fully spent.

A Monumental Variable

But if we grant T Pyxidis to be a Nova, what shall we say about the still more remarkable star Eta Carinae? This famous southern variable (in a nebulous region in the heart of the galaxy) was of the fourth magnitude when first noticed by Halley in 1677. It appears to have been a fairly conspicuous naked-eye object till about 1810, when it rose in brightness. For almost twenty-five years, from 1826 to 1850, it was above the first magnitude, and in 1843 it exceeded Canopus in brilliancy, and was surpassed only by Sirius. After 1850 it faded steadily, and since 1865 it has been fainter than the seventh magnitude, with small fluctuations. It is now of magnitude 8.3, and not more than 1/4000 as bright as at its maximum. Its spectrum during the past thirty years has consisted mainly of bright lines, with a continuous background crossed by dark lines, which, according to Miss Cannon, disappeared about 1895, coincidently with a diminution of the star's brightness by about one-half. This spectrum is strongly reminiscent of that of Novae in certain of their later stages. What the star's light would have revealed in the years of its great brightness we, alas, will never know; for in those days the spectroscope was unknown.

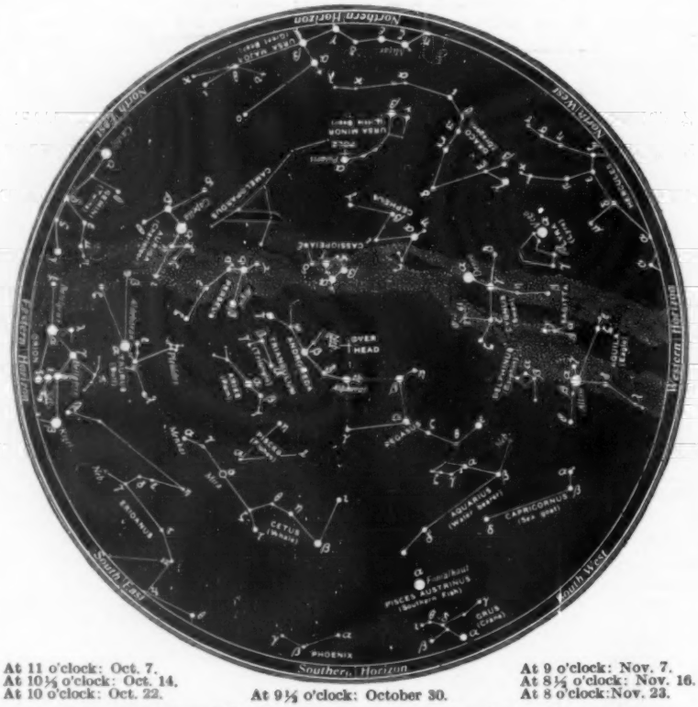
There appears therefore to be a series of objects strikingly similar in spectrum, and all characterized by great and non-periodic fluctuations in brightness. At one end stand the typical Novae, which rise to maximum in a day or two, and fade away in a few years, losing by far the greater part of their light within the first few weeks. At the other end of the scale is Eta Carinae, whose changes have occupied not days, but years.

What Does It All Mean?

It would seem probable, though by no means certain that similar causes are at work in all these variables. What happens during the outbursts, however, is still obscure. We recorded a few months ago the evidence that makes it probable that, in the typical Novae at least, a shell of incandescent gas is actually thrown out from the star at enormous speed; but we can only guess, rather wildly, what the forces behind such explosions can be like.

Certain things, however, are evident. Whatever the catastrophe may be, it does not destroy the star, nor even use up any great portion of it—for T Pyxidis has gone through the process three times in the last thirty years, and is still there. Moreover it must be a standard process, in the sense that it occurs with fair frequency somewhere in the stellar universe, probably as often as once a year. This disposes once for all of the idea that the Novae are produced by collisions between two stars; for it can easily be shown that, even among the billions of stars that probably exist, no two should collide except at average intervals of many millions of years. The hypothesis of a collision between a star and a nebula, or possibly a small body of planetary dimensions, meets this difficulty: but it is hard to see how such a collision could be the direct cause of the expulsion of a shell of gas at such enormous speed.

Perhaps a solution may be found in the idea—supported now by evidence from many quarters—that the stars contain some vast store of energy, of little known nature, which they are gradually transforming into heat and radiating away. Under ordinary circumstances, it is probable that the rate of generation of heat is automatically regulated to balance the loss by radiation. But it is quite conceivable that some sudden disturbance in the substance of the star, near the surface, might cause an abrupt liberation of a great amount of energy, sufficient to heat the surface excessively, and drive the hot material off into infinite space, in much the form of such a shell of gas as seems to have been observed in the case of Nova Aquilae. A collision with a swarm of meteors might easily provide the necessary initial shock—this acting as the detonator, rather than as the bursting charge. If a star has run into one such cloud, there may be others near by, and the repeated outbreakings of Nova Aurigae, and even of T Pyxidis, may thus be simply explained. Such a long-continued outpouring of energy as took place from Eta Carinae is harder to understand. But with the rapid advance of our knowledge of the properties of the stars on the one hand, and of the very nuclei of atoms on the other, we may, perhaps before very many years have passed, find ourselves nearer a solution of the problem.



At 11 o'clock: Oct. 7.
At 10½ o'clock: Oct. 14.
At 10 o'clock: Oct. 22.
At 9½ o'clock: October 30.
At 9 o'clock: Nov. 7.
At 8½ o'clock: Nov. 16.
At 8 o'clock: Nov. 23.

The hours given are in Standard Time. When local summer time is in effect, they must be made one hour later: 12 o'clock on October 7, etc.

NIGHT SKY: OCTOBER AND NOVEMBER

The Heavens

The finest parts of the evening sky are now in the east and west, along the line of the Milky Way, which extends over our heads in a vast arch. Beginning at the west, we find Aquila low down, and Lyra a little higher and to the right. Above the latter is Cygnus—no longer marked by the brilliant new star, which has faded from view to the unaided eye. Then come Cepheus and Cassiopeia, almost overhead, followed by Perseus, high in the east, with Auriga below, and Taurus to the right of the latter. Gemini and Orion are rising, below Auriga and Taurus, but are not yet fully seen.

The northern and southern skies are dull in comparison. The Great Bear is far down on the horizon, and Draco and Ursa Minor are below the pole and to the left of it. Opposite these, across the Milky Way, are Pegasus and Andromeda, close to the zenith. South of this, and extending far to the east and west, is one of the poorest regions of the heavens, which surrounds the southern pole of the Milky Way. The only stars within it which are really conspicuous in our latitudes are Fomalhaut, in the Southern Fish, and Beta Ceti, farther to the eastward. Aquarius, Capricornus and Eridanus, which occupy the remainder of the southern sky, do not boast among them all a single star as bright as the second magnitude.

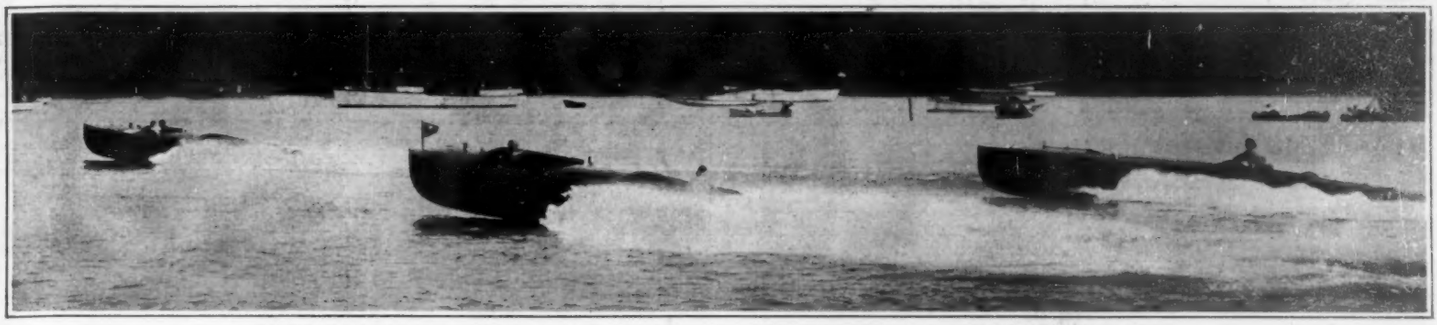
This is true, at least, for observers in our latitude. Farther south, in tropical countries, the rather conspicuous southern constellations of the Crane and the Phoenix become prominent, and the first magnitude star Achernan (Alpha Eridani) comes into sight.

The Planets

Mercury is an evening star all the month, and is best seen about the time of his elongation, or greatest apparent distance from the sun, on the 25th. He is then 24 degrees from the sun, but so far south that he sets a little before 6 P. M. (standard time) and is rather hard to see. Venus is an evening star, and is gradually drawing away from the sun; but she, too, is far south, so that even at the end of the month she remains in sight only until 6:25 P. M.

Mars likewise is an evening star, but farther east, and he therefore remains in sight longer—until about 8:30 in the middle of the month. Jupiter is a morning star, rising at 3:25 A. M. on the 1st and at 1:55 on the 31st. Saturn is about ten degrees farther east,

(Continued on page 392)



The start of displacement boats. Won by "Rainbow" with an average speed of 39.48 miles per hour

The Fastest Boat in the World

THAT amazing little craft, "Miss America," after winnning the Harmsworth Cup in British waters was brought back to America and entered as a contestant in the Gold Cup Regatta, which was held on the Detroit River. She not only won the one-mile championship trials for the Lake George trophy, but secured several other trophies. The contesting boats had to make six one-mile dashes over the mile course. In one trial, which had to be thrown out because only three of the six watches got her time, "Miss America" was clocked at the rate of 78.94 miles an hour. The average time for the six dashes credited the little boat with an official speed of 76.73 miles an hour. Her best official run was made at a speed of 77.85 miles an hour. The performance was very consistent, as will be seen from the following timings: First mile, 47.06 seconds; second mile, 46.2 seconds; third mile, 47.1 seconds; fourth mile, 46.6 seconds; fifth mile, 47.3 seconds; sixth mile, 46.6 seconds.

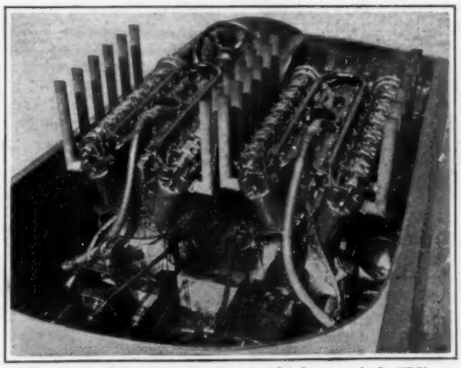
Only one other hydroplane competed in these trials, the "Miss New Orleans," which made an average speed of 58.35 miles per hour, with a fastest lap of an even sixty miles. We show an illustration of the start of displacement boats with stock marine motors for the Fisher trophy. It was won by the "Rainbow," of the Royal Hamilton Yacht Club, with an average speed of 39.48 miles an hour, and a maximum speed of 40.75 miles. The "Miss America" is a diminutive craft with an enormous horsepower for her weight. She has a single step, and is driven by two Liberty motors with a combined horsepower of 800.

Artificial Glaciers for Irrigating Dry Land

AN ingenious method for securing a supply of water for their parched fields during the hot season is practised by the mountaineers living upon the slopes of the Karakorum, the great chain of mountains at the northwest extremity of the Himalayas, and is thus described by Mr. Dainelli, a member of the Italian Alpine Club, in the Bulletin of that organization:

The inhabitants choose points as high as possible in lateral valleys which furnish but little water supply in the summer to the principal valley which it is desired to irrigate. Such spots are chosen as are shut in with steep banks so as to receive little or no sun. During the hot season these valleys are filled with successive layers of straw saturated with water and if possible with dry pine needles and even charcoal. Before the first snow fall the bed thus prepared is covered with pebbles. When the heavy snowfalls of the season are at an end the top layer of snow is covered with straw and then with earth.

"Miss America," running her fastest mile at an official speed of 77.85 miles per hour



The two Liberty Engines which carried "Miss America" to victory

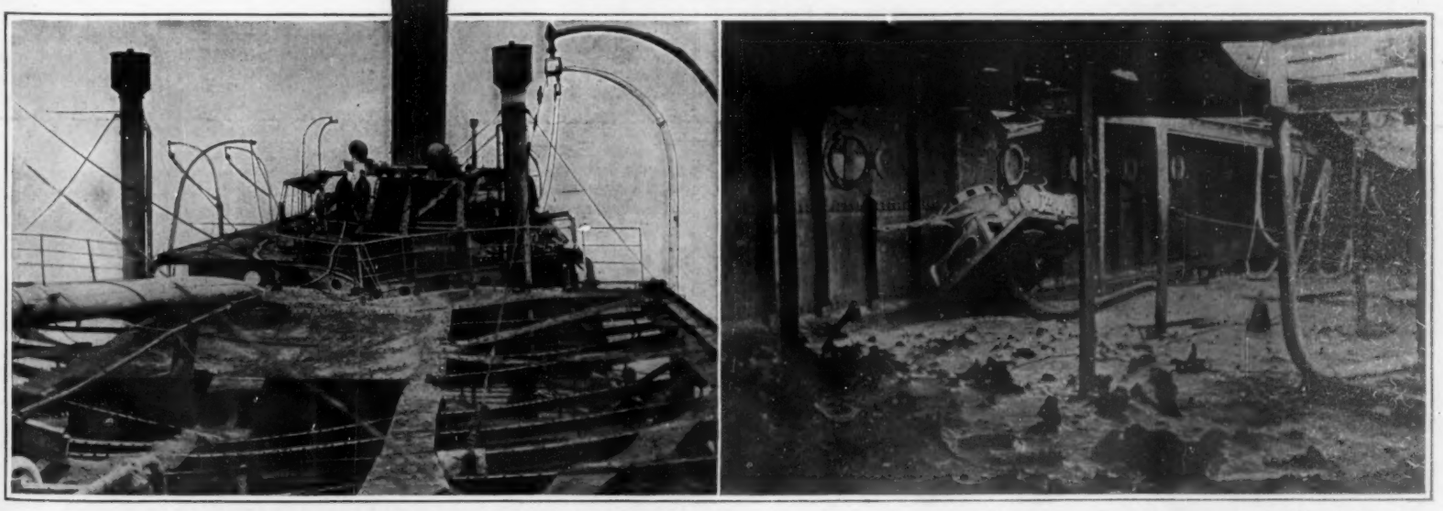
Daring Voyage of a Wrecked Ship

THE United States ship "Ophir" is one of the Dutch merchantmen which were commandeered by the United States. She was employed in carrying supplies to and from the seat of war, and, as fate would have it, on her last trip, she carried some ammunition which caused no end of trouble; for while she was at Gibraltar the ammunition caught fire and sent the ship to the bottom. She lay there for four months, and was subsequently raised by our Navy Department and brought back to the United States.

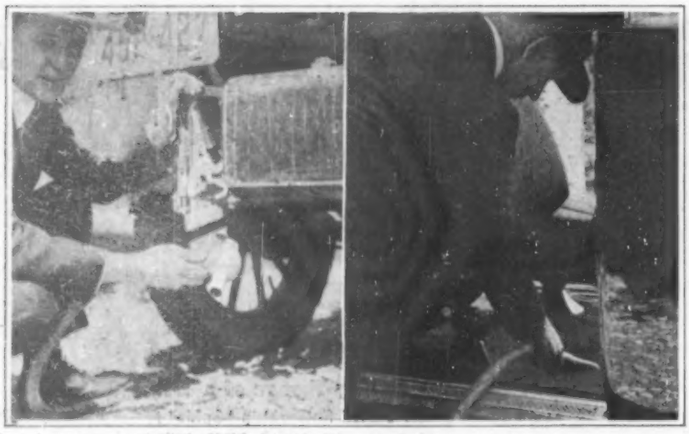
What the fire did to the ship will be understood from the accompanying photographs. The woodwork, it will be noted, was entirely burned away, leaving only the open steel framework of the boat and superstructure deck. Moreover, the ammunition in the hold exploded under the fierce heat, and the shell fragments passed through the steel deck above, giving it the proverbial pepper-box appearance. The ship was in bad shape, for her hold was open to the sea. Nevertheless, it was believed that good seamanship was capable of bringing her from Gibraltar to Norfolk, where it was decided to carry out repairs. As it turned out the "Ophir" during her trip ran into one of the worst storms that the Navy men who brought her over had ever encountered; nevertheless, although she rode with her decks open and with the seas washing through into the hold, she was kept afloat by running the pumps continually throughout the voyage; and though it is estimated that the gale blew at times with a velocity of one hundred miles an hour, the "Ophir" did not send out any S. O. S. call. The courage and skill required under these extremely trying circumstances will be understood, when it is remembered that the photographs herewith shown were taken after the ship arrived at Norfolk.

Selenium

WHILE several fields of usefulness have been found for the element selenium, it may still be produced in far greater quantity than present demands would justify. Consequently its utilization offers an interesting field for research. Professor Victor Lenher has been giving particular attention to the chemistry of selenium oxychloride and has found it to be a solvent with remarkable properties.



Left: **U. S. S. "Ophir," burned and sunk at Gibraltar, was brought to Norfolk, Va., in the condition shown, weathering some heavy storms.** ***Right:*** **The between-decks, showing how exploding shell fragments tore through the steel deck, until it looked like the proverbial sieve**



A member which fastens on to the exhaust of the engine, creates the vacuum for the nozzle used in cleaning the automobile

A Vacuum Cleaner for the Motor Car

THE last word in automobile accessories is the vacuum cleaner which is operated by the exhaust of the engine. This device, which is shown in the accompanying illustrations, consists of a member which is placed on the exhaust of the engine and which creates the vacuum, a long flexible tube, and a suitable nozzle. By running the engine at slow speed a sufficient vacuum is obtained to clean the automobile in a far more thorough manner than can be done with the conventional methods.

Getting Away from the Conventional Rudder

AGAIN we have with us the two-part rudder, which permits a power boat to be reversed without altering the speed or direction of the engine. Similar devices have been described in these columns as far back as two years ago, when a similar scheme was introduced by H. O. Wetendarp of Boston, Mass., with excellent results in the case of a small motor boat.

This time it is a British inventor who comes forth with a two-piece rudder. His device consists of two curved deflectors, each deflector of about the same area as the usual rudder. The rudder post consists of a steel rod attached to one deflector, and a steel tube fitting over the steel rod, which is attached to the other deflector. Two steering wheels are provided, one operating the left blade and the other the right blade. This device is more than a rudder; it is a brake as well. For instance, when the two deflectors are closed and placed directly behind the propeller, the engine may be going at full speed or less, and yet the boat slows down, and then begins to move backward. By gradually opening the deflectors the reversing action becomes weaker and weaker as the propeller has a tendency to propel the boat forward. Swinging both deflectors to one side or the other causes the boat to respond in the same manner as if a rudder were employed. Full speed ahead is attained when the deflectors are open and parallel to each other.

New form of rudder installed on a small motor boat

Expediting the Stamping of Letters on Soft Metals

FOR stamping letters, figures or any characters on metals or other substances while in a soft state, an ingenious marking machine has been placed on the market by a Chicago manufacturer. This machine consists of a frame with a fixed base, said frame carrying a heavy shaft on which two large disks are pivoted. These disks house between their inner walls a number of small disks of tool steel. The disks rotate on their own axes while the characters on their peripheries are used for obtaining the impressions desired.

The device has an automatic feed and each size of character has a fixed feed. Cams and a multiple rack shaft action cause the feed, and the impression is obtained by means of a crank shaft connected with a handle and connecting rod. This mechanism is so constructed that the characters will not break if any part of the metal should develop resistance. The adjustment for obtaining impressions on various sizes of objects or work being done, is controlled by turning the ball handle in either direction and following the gage on the side of the device until the desired impression is reached.

The machine illustrated is for use with hand power, but it may be operated by machine power. A full alphabet and the numerals from 1 to 0 in 1-16, 1-8, 3-16, and 1-4 inch sizes are furnished with the device.

Something New in Electrical Variable Condensers

IN an effort to produce a simpler and more compact construction, an electrical instrument manufacturer has recently introduced the variable condenser shown in the accompanying illustration. Also it is claimed for this new condenser that its results are more constant and that finer adjustments are possible.

Compared with the usual variable condensers used in fine laboratory work and more so in radio communication, with their assemblies of finely separated plates which work in and out of each other without touching, the new condenser is remarkably simple. It consists merely of a fixed plate at the top and a movable plate at the bottom. The bottom plate can be actuated up or down by means of a fine screw thread attached to a suitable handle, thus decreasing or increasing the distance between plates. A spring placed upon the screw operates to open the plates when the nut is unscrewed on the shaft. A mica washer separates the two plates, so that they cannot come into contact with each other. The variation of capacity is obtained by merely screwing the nut upward and downward on the screw shaft, and the thread is selected so that the entire range of capacity is secured by one turn of the nut.

General appearance of the new variable condenser introduced for laboratory and radio work

Scientific Investigation of Artificial Wool

WIDESPREAD interest having been taken in a new artificial wool, an exhaustive investigation into the properties and merits of the fiber has been made by Prof. Eber Midgley, head of the department of textile industries of the Bradford Technical College, whose main conclusions may be summarized as follows:

Professor Midgley has demonstrated by machinery tests that the artificial wool is unsuitable for use in the spinning of yarn on the worsted principle, though he admits that there may be some scope for the employment of the fiber in the woolen industry. It is impossible, however, he adds, to produce from artificial wool a fabric comparable with one composed of pure wool.

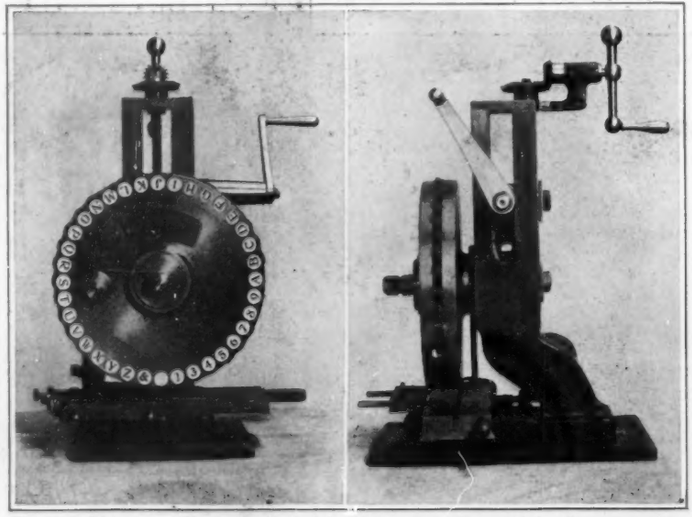
When compared with a low quality of worsted wool, artificial wool indicated a decided lack of uniformity in diameter, strength, and elasticity, factors which are essential in the manufacture of worsted yarns.

In order to provide the artificial wool with most favorable treatment, the Continental systems of combing and drawing were employed. The result of the combing was 39 per cent top and 61 per cent noil, as compared with 82 per cent top and 18 per cent noil in the case of pure wool; while the result of the drawing, blending it with pure wool, was an uneven yarn.

By suitable manipulation a yarn can be spun on the woolen principle entirely from artificial wool, but the type of yarn will be thick and limited to use as weft. Developments can be anticipated on the lines of mixing the material with wool and remanufactured wool for the purely woolen trade; but so long as the present supplies of cotton and wool are maintained, artificial wool and many other substitutes cannot, in Professor Midgley's opinion, in any way affect either the cotton or the wool industries.

Recent Patent Decisions

Wireless Telegraphy.—This is a suit involving the Fleming patent so far as concerned a detector for radio waves. Eight or nine years after the date of this patent, several experts in the radio art, while using these devices as radio wave detectors, observed that the detectors possessed the function of oscillating, or, in other words, of generating radio waves. This was an extraordinary additional property or function of the so-called incandescent lamp detector, of which Fleming had no knowledge. A claim of the patent provides for the combination of a vacuous vessel, two conductors adjacent to but not touching each other in the vessel, means for heating one of the conductors, and a circuit outside the vessel connecting the two conductors. While the claim covers broadly the device when used in the radio art, yet when read with the context of the specification, it is plain that Fleming's disclosure was addressed to the use of the instrumentality as a detector only. It is a principle of the patent law that a patentee is entitled to all the benefits of his invention, whether or not known to or foreseen by him. Therefore the patent is held infringed by a generating device. Judgment for plaintiff.—*Marconi Wireless Tel. Co. v. DeForrest Radio & Tel. Co. U. S. D. C. of N. Y.*



This machine puts the stamping of lettering on soft metal in the same class as the cutting of packing room stencils

Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

Pertaining to Apparel

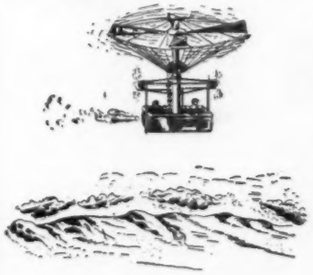
BRASSIERE HOOK.—G. T. COLTER, 419 W. 119th St., New York, N. Y. The invention relates particularly to a hook used with corset covers or brassieres. An object is the provision of an arrangement which may be used for properly holding a brassiere in position in connection with a front or back laced corset. Another object is to provide a hook or fastening means which is adapted to be hooked into or interlocked with the front of a corset without producing an undesirable lump or gathering of material, and also without danger of becoming dislodged when in use.

HOSE SUPPORTER.—A. D. PERALTA, c/o Young & Glen, 68 Broad St., New York, N. Y. The invention relates to garment supporters and is more particularly adapted to hose or socks. The general object is to provide a support which can be conveniently applied and detached, the support preventing suspender ends in looped form through which a portion of the hose may be passed, together with a slide into which a portion of the hose may be drawn and then securely clamped.

SNAP FASTENER.—W. H. LAMMERS, 2495 8th Ave., New York, N. Y. The object of the invention is to provide a snap fastener for garments as distinguished from hooks and eyes, buttons, and the like. Among the objects is to provide a fastener of minimum thickness when applied to the garment. More specifically the fastener comprises head and socket members adapted to be attached directly in the usual manner, but are not easily separable directly, the separator being effected by a sliding movement.

Pertaining to Aviation

AIRPLANE.—H. C. NEAL, Philadelphia, Mississippi. An object of the invention is to provide an airplane embodying features of construction, whereby the airplane acts as a parachute in the event that the engine stops so that the aviator may land with safety. A



A PERSPECTIVE VIEW OF AN AIRPLANE AS INVENTED

further object is to provide mechanism capable of adjustment and operation while the machine is in motion, to enable the airplane to remain in substantially one position to facilitate observations, and to remain in a normal position when standing on the ground.

WING.—H. M. WOLFE, 75 Vesey St., New York, N. Y. The invention relates to aeroplanes and other aerial machines; its object is to provide a wing more especially designed for use on a fighting air craft, and not liable to collapse when subjected to heavy strains or when riddled with bullets. Another object is to render the wing exceedingly durable and capable to readily withstand heavy wind pressure.

Electrical Devices

ELECTRICAL TOY GUN.—T. H. HALLINAN, 213 Madison Ave., Paterson, N. J. An interesting toy is provided by this invention, which permits of rapidly firing a number of shots from the same gun, using electro-magnetism for the propulsive power. The operation of this small, rapid-fire gun is controlled electrically and it may be manipulated by a very small child without danger to the operator or to any surrounding objects.

FLASH LIGHT.—J. VINCE, 429 78th St., Brooklyn, N. Y. The invention relates to portable electric lights of the class including a battery and lamp, the one movable relatively to the other, a shell inclosing the battery and supporting the lamp having means to connect the same in circuit at the front of the battery, together with means tending to separate the lamp and battery to break the circuit at the front of the battery.

ADJUSTABLE ELECTRIC CONTACT.—F. H. LORKING, 10 Davenport Terrace, Wayville, South Australia, Australia. This invention comprises a contact for electrical work which grips an adjusting nut and even when the wire holding nuts are slackened off for adjustment or other purposes remains locked to the insulating lock and is capable of a micrometer adjustment. It is especially suitable for circuit breakers, polechangers and circuit controllers used in signal engineering or other work where comparatively light currents are used.

ELECTRICAL FIXTURE.—F. L. BUTLER, 740 E. 36th St., Chicago, Ill. An object of the invention is to provide an electric fixture in which the stem is effectively insulated from the parts supporting the stem in position so that an electric current is prevented from passing from the current carrying system to the parts of the fixture, without the use of an auxiliary insulating joint such as would otherwise be required.

TELEGRAPH INSTRUMENT.—J. V. GUERRE, Santiago De Cuba, Cuba. An object of the invention is to provide an improved mounting for the parts of the instrument so that the magneto can be adjusted to vary the gap between the magnet cores and the armature operated thereby. A further object is to provide means for controlling and adjusting the elastic support of the armature carrying lever.

APPARATUS FOR PROPAGATING AND INTENSIFYING ELECTRICAL OSCILLATIONS.—J. J. CALLAGHAN, P. O. Box 574, So. San Francisco, Cal. The invention relates to wireless apparatus and has for its object the provision of a construction for propagating and intensifying electrical oscillations so as to approach the frequency of light waves. Another object is to arrange short period oscillating coils in line, with their respective planes parallel in conjunction with a mirror whereby the propagated wave will be unidirectional.

Of Interest to Farmers

AGRICULTURAL IMPLEMENT.—J. VERSTEEG, 802 Pittsburg St., St. Johns, Oregon. The invention has for its object to provide in an implement of the character specified, a means for thoroughly cutting and breaking up the soil as it is turned up by the plow, the said means working upon the strip of earth turned by the plow and being operated by the movement of the plow.

Of General Interest

LAMINATED GLASS.—M. W. GLEASON, address R. B. Cressman c/o Gleason-Tubout Glass Co., 200 5th Ave., New York, N. Y. This invention has particular reference to the construction of vitreous objects such as globes for electric lamps or the like in which the shell is composed of a plurality of laminæ, the innermost of which is of a distinctive color, the outermost of which is clear, while the intermediate layer is of a translucent nature with a neutral tint. Among the objects is to produce a light very similar to natural daylight with an increased strength of globe.

SAFE.—A. H. GERNSBACHER, 1405 Canal St., New Orleans, La. The invention has for its object to provide mechanism of the character specified, for the safe storage of jewels, money, and the like wherein a safe is incorporated in the hollow metal post or posts of a bed, in such position as will always be convenient for the user, the chamber formed being provided with partitions arranged transversely, and having a door provided with a lock.

AUTOGRAPHIC ATTACHMENT FOR CAMERAS.—M. B. BOYCE, 2 5th Ave., Haverhill, Mass. This invention relates more particularly to autographic cameras, the object being to provide a simple and inexpensive means in the form of a series of letter and numeral blocks movable in guided relation, whereby to produce even, legible exposure titles and similar data upon negatives capable of ready manipulation and uniform exposure.

LADDER.—F. M. DE SAUSSURE, JR., 801 E. North St., Greenville, S. C. This invention relates more particularly to folding ladders especially those in which the side rails are swingable by virtue of pivoted rungs toward and away from one another; among the objects is to provide means automatically acting in connection with a supporting surface whereby to lock the said rails of the ladder section in non-shiftable relation when engaged with a supporting surface either in a horizontal line or upon more or less of an incline.

PROTECTED PNEUMATIC HEEL.—W. E. KAY, 422 E. Broad St., Elyria, Ohio. The objects of the invention are to provide a pneumatic heel in which air is confined under pressure, and in which the amount of resiliency is variable under variable pressure according to the weight of the individual wearing it. One of the important features is that the weight will be evenly distributed over the entire wearing surface of the heel, another feature is the use of replaceable tread members so that the wearing position is always renewable without disturbing the body of the heel.

MOP AND BRUSH HOLDER.—L. WECHSLER, 514 W. 126th St., New York, N. Y. This invention relates to scrubbing and brushing apparatus and has particular reference to a device designed to hold either a mop head or a scrubbing brush. Among the objects is to so construct a mop stick and attachment means at the end thereof as to accommodate the device for holding and manipulating any one of several different types of cleansing devices.

SAFETY RAZOR.—A. H. BRYANT, Glen Ridge, N. J. Among the objects of the invention is to provide a holder for a thin blade which will expose the entire length of the cutting edge of the blade and which will hold the cutting edge firmly along a predetermined line in respect to the holder. A still further object is the provision of a holder for a safety razor blade which is formed comparatively thin and compact and with all the resilient members formed as integral parts of the head.

WHISTLE.—J. C. WARD, 817 E. 17th St., Little Rock, Ark. The invention relates more particularly to a whistle to be placed between the lips of the user and in which the body of the whistle is formed with a transverse orifice, the sound being produced by blowing air across the orifice. The invention is also provided with a movable member under the control of the user and arranged to be vibrated to produce trills or intermittent whistling sounds as well as the clear strong whistling sound.

SPECTACLE SHADE.—K. R. GITTERMAN, c/o A. C. Harragin, 30 Le Compt Place, New Rochelle, N. Y. An object of the invention is to provide a tinted or clouded eyeglass shade preferably made of celluloid which may be mounted on the frame or lens of the eye glass or spectacles in order to form a pair of shaded spectacles or eyeglasses. It is an object to provide shade pieces which are small and convenient to handle, and which may be

A PAIR OF GLASSES, SHOWING ONE GLASS WITH SHADE HOOKED ON

carried in the spectacle case with the glasses and be placed in position over the lenses and held there by hooks and removed at will. The same inventor has also been granted a patent for spectacle frames, which may be used in connection with the shades so that a simple shade may be slipped in position into the rim holding the lens.

MARKING DEVICE.—G. J. ANDERSON and W. R. SMITH, 4808 Superior Ave., N. E., Cleveland, Ohio. This device is adapted particularly for branding articles such as rubber tires, inner tubes and the like. It is designed for efficient use with articles having curved, rounded or other abnormal forms or contours. The dies or stamps are adjustably held in the device and can be manipulated while the device is in use so as to contact efficiently with the surface to be marked.

ILLUMINATING ATTACHMENT FOR TELESCOPES.—E. L. BECK, Manor, Pa. The object of the present invention is to increase the utility of telescopes by providing an illuminating device to render the cross hairs more visible. This is of particular advantage in surveying instruments. The illuminant consists of a light cell attached to the eye piece, which contains a small electric lamp and reflector that casts the light upon the cross hairs.

LIQUID DISPENSING DEVICE.—W. F. LERCH, 30 Fannington Ave., Hartford, Conn. The purpose of this invention is to furnish a convenient form of container for iodin or similar liquids, such as antiseptics or astringents, to treat cuts, wounds, sores and the like. It is particularly adapted for the treatment of the throat and gums, for surgical and dental operations and for the treatment of insect bites.

ACCOMMODATION LADDER FOR MARINE VESSELS.—E. J. SIMS, c/o Bauer, 223 Schermerhorn St., Brooklyn, N. Y. This ladder is arranged to be conveniently moved into position for use over the side of a vessel or to be returned to inactive position on a deck when not in use. Means are provided to prevent the stairway or ladder from being broken or otherwise damaged while being moved into active position or back into inactive position.

SLIP COVER FOR CANS.—H. L. STRONGSON, address Loeb-Strongson Corporation, 25 East 112th St., New York, N. Y. The invention relates to tableware, milk tins, or sealed cans of all varieties, and provides a cover to conceal the unsightly appearance of the milk tin when it is placed on the dining table. The slip cover is of pleasing appearance and is provided with a pouring spout.

CONSTRUCTION OF OPHTHALMIC MOUNTINGS.—O. G. SCHUTZE, 73 Victoria Street, Forestville, near Adelaide, State of South Australia, Australia. By means of this invention lenses of rimless spectacles or pince-nez may be secured to their straps to be adjusted as either "central," "inset" or "offset," and either in "level" or in "lowered" position. The invention also simplifies the assembling of individual members of the mounting in the case of pince-nez.

METHOD AND APPARATUS FOR CONSTRUCTING CONCRETE PILES.—S. M. COTTEN, c/o Office Engineer, City Engineering Department, Phoenix, Ariz. The invention relates to the construction of "cast-in-place" concrete piles. It provides a new method of driving and casing the hole in the ground (into which the concrete pile is cast) so as to develop a minimum of resistance to penetration. This object is accomplished by using telescoping cylindrical sections so designed, related and actuated that skin-friction between the casing and the ground penetrated is practically eliminated.

MERCURY-VAPOR LAMP.—M. J. CORNU, 26 Rue de Babylone, Paris, France. This lamp consists of a thick-walled quartz tube containing two electrodes between which an arc of small length but of high specific brilliancy is formed. The thickness of the tube is equal to at least half the internal diameter, so that the heat of the arc is retained and the mercury vapor is maintained at a high temperature.

AWNING.—W. H. MCOMBER, 803 Chicago Ave., East Chicago, Ill. The present invention covers an improved awning particularly designed for internal use at windows or other openings for supplying a continuous current of cool air to the sleeper in a bed adjacent to the window. The construction is such that the air is constrained to flow in at the lower part of the casement over the face of the sleeper and out above the upper casing.

CAN WASHER.—G. C. WILTSIE, 326 Avenue B, Schenectady, N. Y. One of the principal objects of this invention is to provide means whereby the cream ordinarily left in a milk can after the same has been emptied may be saved. It is quite common in a creamery or ice-cream plant for as much as a pint or a quart to adhere to the can. By means of a rinsing and sterilizing apparatus this cream may be washed out of the receptacles and recovered.

GUN CONTROL.—S. MCG. THOMPSON, Box 745, Fernandina, Fla. Special means are provided in this invention for controlling a gun mounted on the deck of a vessel so as to keep it normally in a horizontal position, or in any other predetermined position regardless of the roll of the vessel. A U-shaped mercury tube mounted upon the gun is arranged to control certain motor operated devices for elevating and depressing the gun so as to keep it always trained on the target.

WELL BUCKET.—C. D. BEHAN, Stigler, Okla. Mr. Behan provides in the present in-

vention a bucket especially designed for use in wells of small diameter, for instance, cased wells. The bucket is provided with a valved bottom so that it can fill from the bottom without having to be tilted. In the same way it may be emptied from the bottom when at the top of the well.

BALL BEARING COUNTER.—R. B. AUSTIN, Deceased (Cyrus B. Austin, Administrator), Delaware, Ohio. In order to provide a rapid means of taking any predetermined number of balls from a container and thus dispensing with the necessity for the separate counting of them the inventor provides a plate formed with a predetermined number of perforations in which the predetermined number of balls will be held while the remainder will roll off when the pate is tipped.

ICE-CREAM DISPENSING DEVICE.—W. L. HIX, 1306 Gartland Ave., Nashville, Tenn. The object of this invention is to provide a device by means of which quantities of ice cream of various flavors may be held in a single container and may be dispensed from the bottom of the container in blocks of predetermined size. Means are also provided for gradually moving the cream downward in the container as it is removed at the bottom.

CLOSET VENTILATOR.—E. A. JOHNSTON, Park Ave., Johnstown, Pa. A motor-driven exhaust fan is employed for exhausting the air from the bowl and a float and seat operated switch are provided for controlling the action of the motor and fan. A switch having a spring pressed plunger holds the seat in a normally slightly elevated position and means are provided for throwing the switch and stopping the motor upon flushing the bowl.

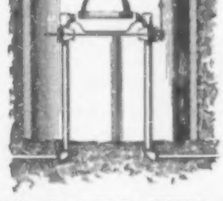
COMBINED ADVANCE DISCOUNT VOUCHER CHECK, ORDER, AND COMMERCIAL LETTER.—J. H. CAMP, Ravenswood, W. Va. The invention relates to a written instrument or combined voucher check, blank order and personal letter from the seller to the purchaser, and a blank letter for reply to the seller from the purchaser. The invention aims to eliminate the necessity on the part of the traveling salesman in disposing of merchandise.

TURE CAP.—A. LANDGREBE, 1724 Barnes Ave., Van Nest, Bronx, N. Y. Among the objects of the invention is to provide means whereby the conveying tubes for dispensing beverages may be kept in a most sanitary condition, but providing for the most expeditious cleansing of the same when necessary. The caps as well as the tubes may be made of any suitable material such as glass, porcelain or the like.

Hardware and Tools

CLIPPER.—J. W. PRICE, Box 651, Henryetta, Okla. The invention has for its object to provide a simple inexpensive mechanism of the character specified suitable for any form of clipping, wherein the parts are easily operated, may be easily disassembled for any purpose, and are practically noiseless in operation.

METER SUPPORT.—C. C. BRADFIELD, Harbor Springs, Mich. The invention relates more particularly to meter supporting connections within meter boxes, the object being the provision of mechanism by which a meter may be readily and quickly removed and replaced



A VERTICAL TRANSVERSE SECTION THROUGH THE METER BOX, SHOWING INVENTION

from the cover of the box in such a way as to insure rigid support of the meter in its operative position, and effective non-leaking connection between the meter nipples and the elbows.

PORTABLE CLAMP.—A. ANTHONY, 1037 N. Castle St., Baltimore, Md. This invention relates to clamps used in wood working, a purpose is the provision of a simple clamp of the type comprising a stationary jaw and a movable jaw, and cam actuating means for securing the movable jaw in any adjusted position; in this device screws are eliminated and in their stead cam levers substituted, permitting of quick adjustment.

DETACHABLE SPRING HINGE.—P. KLEIN and H. HUMPHREY, 181 Giessner Ave., Mansfield, Ohio. An object of the invention is to provide a detachable spring hinge composed of two levers, and consisting of only two parts, the part fixed to the door or window frame and the part associated with the spring so that no spare parts will become lost when the hinge is not in use. Another object is to provide a spring which will allow of quick and easy removal of the door or window from its frame.

SHADE FIXTURE.—W. MCC. NEALE, Box 351, Greensboro, N. C. This invention has for its object to provide a simple, efficient, inexpensive device for permitting a shade to be raised or lowered when desired without the necessity of springs and without the necessity of handling the shade itself. A steady continuous pull on a cord will raise the shade and a slight continuous release of the cord will lower the shade. A quick and total release of the cord locks the shade in adjusted position.

TUBE COMPRESSOR.—J. J. BOWES, JR., 1508 E. Jackson St., Pensacola, Fla. The object of the invention is to provide a device adapted for compressing a flexible tube to prevent the flow of liquid therethrough, as for instance the tube of a syringe, wherein the arrangement is such that the tube will be efficiently clamped shut assuring a water-tight closure without undue wear on the tube.

Heating and Lighting

WATER HEATER.—DE FOREST L. RATHBONE, Box 1020, Jacksonville, Fla. The object of the invention is to provide an automatic water heater which employs live steam as the heating means for the water, the steam valve being thermostatically controlled by an arrangement of certain of the heater parts with the ultimate result that the temperature of the usable water is kept at a substantially uniform degree.

HEATER.—H. FICKERSEN, 718 Park Ave., Hoboken, N. J. The invention relates to a heater with a construction of lining which prevents the radiation of heat through the sides of the heater, and directs the heat through the top. A further object is to provide a lining which may be inserted in an ordinary oil heater and which may be adapted for other forms of heater without changing the construction.

ROLL HEATING DEVICE.—A. S. RICE, 108 W. 22nd St., New York, N. Y. The invention relates more particularly to roll warming devices for use in hotels, restaurants and the like. The prime object is to provide a device in which the heat supplied is furnished by a heater of the electric type. A further object is to construct the device in such manner that the heated interior is automatically provided with necessary amount of moisture, to prevent the drying out of the rolls.

Machines and Mechanical Devices

MACHINE FOR PEELING TOMATOES.—C. KIRINO, P. O. Box 418, Ogden, Utah. The invention relates to a machine for peeling tomatoes or other vegetables or fruit having a skin of a nature to be loosened by scalding; it more especially relates to a machine through which the fruit is run and whereby the skin is divided into sections while on the fruit and subsequent operations performed of scalding the tomato and removing the skin sections. A distinguishing feature is the provision of means for impaling the tomatoes without bruising or crushing them.

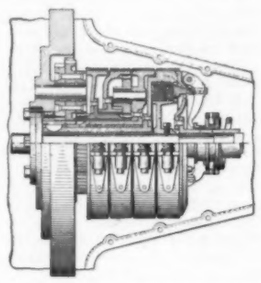
BARREL WASHING MACHINE.—H. REININGER, c/o Consumers Brewing Co., Cleo and Liberty St., New Orleans, La. The object of this invention is to provide a construction whereby the interior and exterior surface of a barrel, package or the like may be substantially simultaneously cleaned. A further object is to provide a single structure in which a number of different steps are provided for the cleaning so that the barrel may be fed in at one end and discharged at the other without manipulation or guidance by an operator, the soaking, washing and scrubbing being carried on automatically.

PERFORATING MACHINE FOR BANK DRAFTS AND OTHER DOCUMENTS.—G. A. CROCCO, Rome, Italy. The invention refers to perforating machines in which numbers and words are first prepared singly by rotating the lettered or numbered disks of a setting device which is then brought in such position as to cause groups of pins or punches to pass through and to pierce the paper, leaving in same a number of holes to show the figures or letters impressed.

DETACHABLE FASTENER FOR CYLINDRICAL SCREENS.—W. L. LEACH, 110 E. Broadway, Brownwood, Texas. More particularly the invention relates to means to detachably connect and fasten the ends of a strip of reticulate material in order to form a grading cylinder, which may be interchanged and renewed without difficulty, rendering the cylinder adaptable to various uses by inserting screen mesh of different gages.

GLOVE TURNING MACHINE.—D. BAUM, Livermore Falls Glove Co., Livermore Falls, Me. Gloves, particularly the cheaper grade of cotton, canvas and similar woven material, are made wrong side out and must be turned before forwarding to the trade. The invention has for its object to provide means for quickly turning the gloves, the device operating entirely automatically.

PLANETARY GEARING.—S. V. DICKMAN, Shavertown, N. Y. An object of this invention is to provide means whereby three forward speeds and a reverse can be transmitted from the drive shaft to the driven shaft by the selective operation of brake bands controlling



A VIEW PARTLY IN ELEVATION, PARTLY IN SECTION

drums. A further object is to provide mechanism of the character stated which is compact in assemblage, comparatively simple in construction and strong and durable in use.

WAVE MOTOR.—J. W. SOUTHWICK, 752 Excelsior Ave., Akron, Ohio. The invention has for its object to provide mechanism for converting the energy of the waves into useful work. The device comprises a reservoir, a funnel-shaped passage leading from the shore to the front wall of the reservoir and adapted to receive the breaking waves, a pipe leading from the small end of the passage delivery to the reservoir, and turbines in the bottom of the reservoir for utilizing the water power.

MACHINE FOR MAKING PAPER BOXES.—A. W. HARRIS, Sleepy Eye, Minn. This invention relates more particularly to a machine for the making of box bodies open at the top and bottom, and such as are used by florists, market gardeners and other persons for growing young plants therein to be subsequently transplanted in lieu of the flower pots heretofore used for this purpose, such boxes being known in the trade as dirt bands.

DOOR OPERATING MECHANISM. — J. BALOC, 742 Altic St., Hazleton, Pa. The object of the invention is to provide an automatic door opening mechanism particularly designed for opening and closing garage doors and the like, and arranged to open the doors by an advancing automobile, to keep the doors open until the vehicle has safely passed and finally to close the doors and hold the same in closed position.

EMBROIDERING MACHINE.—J. G. F. ROOKER, Vryenban, near Delft, Netherlands. The invention relates to a machine for automatically sewing characters, figures, etc., in woven materials and the like. The machine is arranged in such a manner that a predetermined character, word or number can be sewed once in a piece of material or more than once subsequently in different pieces of material, the machine needing to be adjusted but once.

VALVE.—S. J. CONNELL, 115 9th St., Brooklyn, N. Y. The invention relates more particularly to a valve for steam traps, the purpose being to permit the exhaust of water of condensation when the latter reaches a predetermined level, an object being to provide a valve which can be quickly assembled, which will maintain a higher closure, and which will comprise but two main parts coupled together without employing nuts, bolts or other removable devices.

ATTACHMENT FOR EARTH-WORKING MACHINES.—L. H. TOWNER, 3rd and Lake Sts., Muskogee, Okla. Among the objects of the machine is to provide an attachment for a road grader or road drag, to prevent the side draft or side skidding of the rotatable disk, an to provide for its operating within the earth for a suitable distance, and to provide means to vertically adjust the anti-skidding disk, so that it may be elevated above the earth during the transportation of the machine.

SAFETY GUARD FOR PUNCH PRESSES.—A. KOETTING, 423 Wythe Ave., Brooklyn, N. Y. The object of this invention is to provide an automatic guard or fender adapted to be brought successively into position to protect the operator's hands from injury due to the descent of the power operated tool such as a punch, die, or the like. The device will not interfere with the normal intended operation of the machine.

PEGGING MACHINE.—J. LARSEN, 13 Frederik den VII Gade, Copenhagen, Denmark. The invention relates to a pegging machine for use in the shoe-making industry. The machine performs the pegging in a manner strikingly resembling hand work, the peg being forced down into the hole produced by the awl by a hammer stroke which is like the strokes by which the shoe maker drives in pegs.

MACHINE FOR FORMING ROLLS ON TOY BALLOONS.—H. R. GILL, c/o Eagle Rubber Co., Ashland, Ohio. An object of the invention is to provide an arrangement of rotary brushes having flexible covers thereon of chamois, muslin, cheesecloth or other suitable material, which frictionally engage the open end portion of the toy balloons and roll the same to form a bead thereon. A further object is to provide means for guiding and feeding the balloons to the head forming device.

APPARATUS FOR PRODUCING DRIVING BELTS.—A. CARLSEN, Lyngby, near Copenhagen, Denmark. The object of the invention is to use cross-woven linen tracks, i. e. linen in which all the threads run diagonally and all end in the edges, which by a special gluing machine are gued together in plies. By using diagonally woven linen the belt does not fray in the edges, its strength is increased, and it is not so liable to be destroyed by running on small pulleys.

GLOBE VALVE.—W. H. JOHNSON, 6217 Loomis Bldg., Chicago, Ill. The invention has for its object to provide mechanism in connection with valves, so arranged that whenever the valve is turned to open or close it will be ground at its seat to provide for intermittent regrinding of the contact surfaces of the valve and seat, and wherein the controlling mechanism is outside the valve casing.

DENTAL CROWN-MAKING MACHINE.—I. NAVARRO, M. Santa Capilla a Majares No. 15, Caracas, Venezuela. Among the principal objects of the invention are to facilitate the manufacture of dental crowns, to provide a power machine having substitute parts to permit employment of a machine for various operations, and to provide a machine for performing the entire operation resulting in completing the crown.

Medical Devices

DOUCHE CAN.—F. J. O'ROURKE, 8th Ave., Whitestone, N. Y. The object of the invention is to provide douche cans with diaphanous indicators whereby the user can see at a glance when the water or medicated liquid contained in the can begins to flow out to the afflicted part, and whereby the user can gage the amount of liquid discharged. Another object is to protect the indicator which is usually glass, against accident and to readily replace the same in case it becomes defective.

Musical Devices

SOUND BOX FOR PHONOGRAPHS.—A. ROGATI and L. ARONNE, Kimberly Phono Co., 226 Fayette St., Perth Amboy, N. J. The invention relates to sound producing machines. Among the objects is to construct a sound box with front and rear walls, and provide means for connecting the periphery of one wall to that of the other. Another object is to provide means coöperating with the stylus bar for varying the volume of the tone produced by the machine.

REPRODUCER FOR TALKING MACHINE.—J. W. KAUFMANN, 1730 N. Monroe St., Baltimore, Md. The object of the invention is to provide a connection between the needle and the diaphragm controlling lever which will eliminate the usual rigidity between these parts, substituting a resilient connection, of a substantially U-shaped spring connecting the needle holder with the reproducing lever.

PLAYING DEVICE FOR STRINGED MUSICAL INSTRUMENTS.—C. HABERMAN, 87 Ferry St., North Bergen, N. J. The object of this invention is to provide a playing de-

(*Continued on page 388*)

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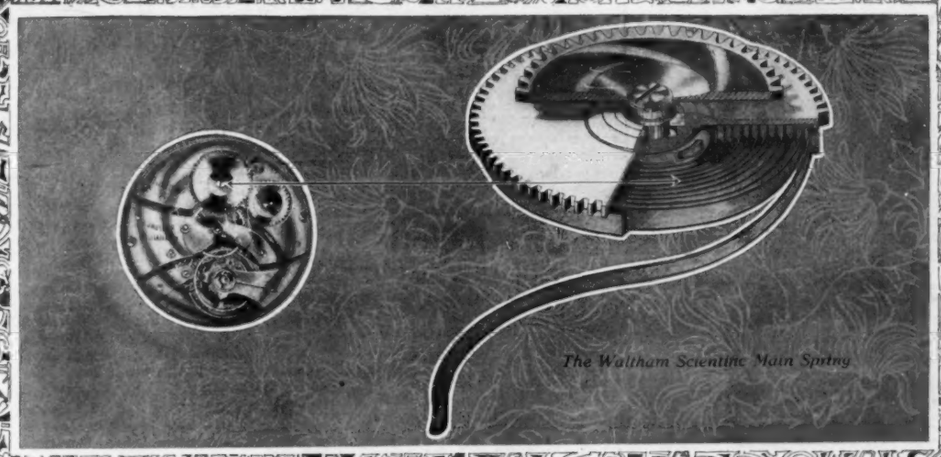


THE MOST SCIENTIFICALLY BUILT WATCH IN THE WORLD

The Waltham Scientific Main Spring— The Power That "Drives" Your Watch

THE Main Spring is to a watch what gasoline is to an automobile — the power that drives the mechanism.

With this difference — that the Main Spring of a watch must supply power with a constant and even tension — with no acceleration or diminution in order to secure accurate time-keeping.

A Main Spring should measure in length, width and thickness correctly for the particular size of watch it is to fit — as, for example, a Main Spring for a gentleman's size high-grade watch should measure 25 inches in length and be approximately three times the thickness of a human hair.

The problem that confronted watchmakers was to produce a Main Spring without any variation of thickness for its entire length. This problem was solved by John Logan, an inventor of the Waltham Watch Company, who perfected a method and created the machines which have made Waltham the largest and most famous Main Spring producers in the world.

The superior time-keeping ability of Waltham Watches created a world demand for Waltham Main Springs.

You will observe in the illustration (above) that a unique feature of the Waltham Main Spring is the reverse curve, so difficult to produce, yet so essential to time-keeping dependability.

This reverse curve adds power as the spring tension diminishes, giving the Waltham Watch an equality of motive power during the twenty-four hour interval of winding.

From the brief description and proof it is easy to understand that the unscientific hand-made Main Spring will cause erratic time-keeping and dissatisfaction.

The Waltham Scientific Main Spring protects the money you pay for a watch and provides another important reason why your Watch Selection should be a Waltham.

Waltham Colonial A
Extremely thin at no sacrifice of accuracy
Maximus movement 21 jewels
Riverside movement 19 jewels
$200 to $325 or more
depending upon the case

This story is continued in a beautiful booklet in which you will find a liberal watch education. Sent free upon request. Waltham Watch Company, Waltham, Mass.

WALTHAM

THE WORLD'S WATCH OVER TIME

RECENTLY PATENTED INVENTIONS

(Continued from page 386)

vice more especially designed for playing the melody strings without the use of picks. Another object is to construct the device in a simple manner, and to enable the player to sound the strings with a tremolo effect in case such is called for by the music.

Prime Movers and Their Accessories

ROTARY ENGINE.—J. G. PORTER, 914 Macdonald Ave., Richmond, Cal. This invention relates more particularly to rotary engines which are operated by direct and expansive pressure of a motive fluid or gas introduced therein, and has for its object to produce an engine which shall be simple in construction and operation and in which the operation is wholly internal and having an adjustable expansion control.

LOCKING DEVICE FOR ECCENTRIC BUSHINGS.—F. J. MCAVOY, 496 Clinton Ave., Newark, N. J. The invention relates to internal combustion engines such as are in use on automobiles. The object is to provide a locking device for eccentric bushings arranged for convenient attachment to the engine or motor to lock the eccentric bushing in place and to allow of using the device as a spanner wrench for turning the eccentric bushing after the same has been unlocked.

Another patent granted to the same inventor provides a locking device for a bushing provided with an eccentric on which is journaled a sprocket wheel engaged by a sprocket chain to be tightened, the said sprocket wheel being connected with the shaft of the motor generator and the sprocket chain being driven from the motor shaft and driving the motor cam shaft and the ignition timer shaft.

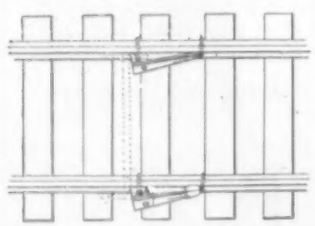
MULTIPLE INTAKE MANIFOLD.—H. P. STURM, Clarksburg, W. Va. The foremost object of the invention is to provide a manifold for an internal combustion engine, which is so designed and constructed that the proper velocity of the fuel is maintained at all engine speeds, retaining the original atomization created in the carburetor and preventing condensation on the walls of the manifold; a further object is to provide means whereby the auxiliary or high speed conduit can be cut in either automatically or manually.

INTERNAL COMBUSTION ENGINE.—G. S. MACDONALD, 114 E. 19th St., N., Portland, Ore. An object of the invention is to provide an engine which will operate economically and efficiently on crude oil, fuel oil and other liquid fuels. A further object is to provide a device having means for maintaining a supply of fuel, under constant pressure to an atomizer which discharges into a combustion chamber, the latter being filled with compressed air and the walls of the chamber being heated so as to ignite the mixture.

SPARKING PLUG FOR INTERNAL COMBUSTION ENGINES AND METHOD OF MANUFACTURING THE SAME.—C. E. GERBAUD, 102 Rue Pelleport, Paris, France. The primary object of the invention is to provide a sparking plug, the constituent parts of which are so united as to form a single integral piece which will have the effect of obviating the leakage of gas or lubricating oil. A further object is to provide a plug capable of withstanding very great temperature and heavy pressure.

Railways and Their Accessories

CAR REPLACING DEVICE.—W. MATNEY, Box 32, Stone, Ky. It is the purpose of the invention ot provide a device for replacing cars upon the rails of a track. A further object is to provide a simple device which is reversible and may be employed for replacing

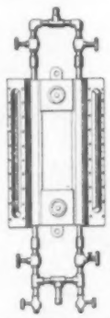


VIEW SHOWING TOP PLAN VIEW OF TRACK WITH DEVICE APPLIED

cars upon the track in either direction, having interfitting connections with the heads of the rails of a track and means which coacts with the rails for securely holding the device in operative position.

DRAW BOARD FASTENER.—A. JAEGER, 671 Front Ave., Grand Rapids, Mich. An object of the invention is to provide a fastener which is especially adapted for securing a draw board against movement and which will permit the easy removal of the fastener when desired. The invention particularly relates to such draw boards as are used in loading or unloading freight cars from docks, platforms, etc.

WATER GAGE.—D. M. MCCOOK, 409 3rd St., Manchester, Ga. A purpose of this invention is to provide a plurality of water gages arranged to give the same indications which can be observed from various angles so



SHOWING A FRONT ELEVATION AND ARRANGEMENT OF GAGES

that when applied to the boiler of a locomotive the quantity of water in the boiler can be readily determined by the engineer and fireman without moving from their respective working positions.

DOUBLE HEADING AIR BRAKE SYSTEM.—E. R. HEWITT, 15 Macomb St., Plattsburg, N. Y. This invention relates to trains headed by two or more locomotives; its object is to provide an air brake system arranged to place the engineer of the first locomotive completely in control of all available air pressure of the several locomotives. Another object is to utilize the air pressure of the main reservoir of the second locomotive to automatically assist the train pipe air pressure from the first locomotive in recharging the auxiliary reservoir of the train.

Pertaining to Recreation

RACE GAME APPARATUS.—R. M. BRENNER, P. O. Box 151, Palisade, N. J. Among the objects of the invention is to provide a game apparatus for use in pleasure grounds, parks and other places and arranged to enable a number of players simultaneously to manipulate racing objects such as figures of horses with a view to cause such objects to travel over individual tracks thereby simulating a race, the winning being solely dependent on the skill of the player.

TOY FORT.—H. E. COATES, 2015 Stoatway, Sacramento, Cal. The invention more particularly relates to a toy fort on which a gun is mounted and from which a figure representing a gunner is adapted to emerge upon the tripping of a trigger controlling the mechanism, the arrangement being such that as the figure emerges the gun will be automatically fired to give the effect of having been fired by the gunner.

AUTOMATIC SELF-PROPELLED TOY TANK.—C. A. LEWIS and H. E. SMOCK, c/o Die Products Co., Dayton, Ohio. The invention has for its object to provide means which will automatically operate to cause a toy tank to travel or move forward in an irregular course or path. Another object is to provide means for causing one end of the tank to move up and down in a vertical plane when driven, and to cause the guns thereon to be oscillated or moved when the tank is in motion.

Pertaining to Vehicles

SCREEN FOR WINDSHIELDS.—F. MCMAHON and R. A. HOUSTON, South Charleston, Ohio. This invention has for its object to provide a device wherein a perforated curtain is provided, having means at its ends for permitting it to be connected to the windshield supporting frame of a motor vehicle, to prevent the passage of bugs and the like when the shield is open.

LOAD CARRIER FOR AUTOMOBILES.—W. K. YOST, Box 488, San Antonio, Texas. An object of the invention is to provide means for carrying sample trunks or other loads at the rear of the tonneau of an automobile. The device is more particularly intended for use as an attachmet for a roadster with flat body extension. The carrier can be quickly applied or removed and folded into small space for storage.

ELEVATING TRUCK.—C. M. HENDERSHOTT, 39 Adsit St., Hornell, N. Y. The invention has for its object to provide a truck of the character stated which can be easily operated, and which will be of maximum strength and durability: the platform may be given any elevation desired and when elevated will securely support the load thereon.

LICENSE CARD.—C. H. CORNELL, Valentine, Neb. This invention has for its object to provide a card of the character specified especially adapted for use with motor vehicles wherein the card has a form providing for a complete description of the car and of the owner or other person to whom the card is issued and designed to be used with a plate or license tag.

GEAR SHAFT.—W. G. DRUMMOND, 112 S. 6th St., Alhambra, Cal. The invention relates to transmission devices for automobiles and motor cars, and particularly to gear shifting devices for use in connection with constant mesh gear sets, the object being the provision of an arrangement which will permit of manual selection of the gears to be engaged and automatic completion of the selected engagement when the clutch is disengaged.

TIRE HOLDER.—A. F. ENGEL, 650 Wayne Ave. An object of this invention is to provide a tire holder such as is commonly carried on motor vehicles and which permits ready insertion or removal of the tire. A further object is to provide a holder which can be swung to one side to provide a free entrance or exit for the tire, and which when moved into position and locked, will securely hold the tire against accidental movement.

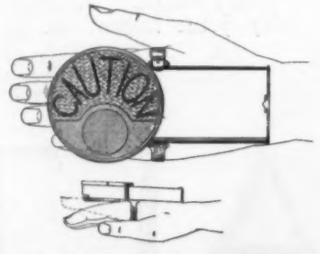
AIR PUMP.—S. S. AVERY, Pleasant Lake, Ind. The invention relates more particularly to hand pumps for inflating pneumatic tires. One of the principal objects is to provide a single cylinder pump in which the operation is double acting. A further object is to construct the pump cylinder in such a manner that up stroke of the piston is limited in its length and cushioned by a body of air which is trapped in the top of the cylnder.

RESILIENT WHEEL.—T. T. CHALONER, 510 W. 47th St., New York, N. Y. The object of this invention is to provide a construction whereby a resilient effect may be secured and at the same time any skidding or side strain taken up without injury to any of the parts. A further object is to provide a resilient wheel which is formed in sections with a set of springs and a casing therefor formed at the outer part so as to give sufficiently to allow of a proper action of the springs.

OIL FEEDER.—A. E. NICHOLLS, Wilson Creek, Wash. This invention has for its object to provide a feeder especially adapted for use with internal combustion engines of motor vehicles, the arrangement being such that all the bearings of the crank shaft will be thoroughly lubricated regardless of the degree of inclination of the oil pan.

ROAD SHOE FOR AUTOMOBILES.—L. S. ROBBINS and W. E. GILMORE, 706 Walnut Ave., Klamath Falls, Oregon. Among the objects of the invention is to provide for each of the rear or traction wheels a gripping device adapted to be introduced beneath the forward bottom side portion of the wheel to enable an automobile or similar vehicle to easily and quickly extricate itself from a mudhole or other road difficulty, the device being so constructed as to enable the wheel to secure adequate hold on the road.

AUTOMOBILIST'S CAUTION SIGNAL.—W. W. KUHLMANN, 124 29th St., Woodcliff-on-Hudson, N. J. The invention relates to a signal device which includes a battery, lamp, switch and signal element and is adapted to be worn on the sigaling hand of an automobilist

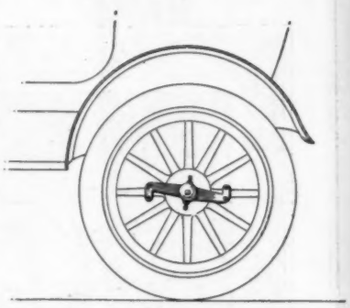


AN ELEVATION AND VIEW SHOWING HOW THE FINGER IS USED TO CLOSE THE LAMP CIRCUIT

so that in driving at night he can warn the driver of a car in the rear of the fact that he is slowing down to make a stop or turn.

REVERSING FAN.—P. JENSEN, Wayne, Alberta, Canada. This invention particularly relates to fans for circulating air about automobile engines and through automobile radiators. An object is to provide a radiator cooling fan of the reversible type which is controllable from the driver's seat so that the volume of air may be varied to suit the temperature needs of the automobile engine.

REPAIR HUB AND WHEEL PULLER.—C. N. SRADER, 116 W. Elm St., Enid, Okla. The invention has for its object to provide a device especially adapted for use in repairing broken Ford rear hubs, for permitting the car

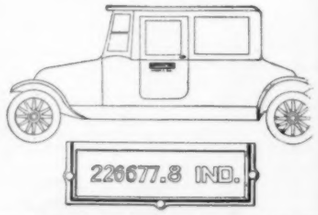


REAR WHEEL OF VEHICLE WITH REPAIR HUB IN PLACE

to be used after the hub is broken and to be safely driven a reasonable distance, as for instance, to a repair shop. The device comprises a cap being internally threaded for engagement with a hub and arms extending from the cap engageable about the spokes.

LUBRICATING PACKING.—H. A. LACERDA, c/o R. W. Benson, 50 Church St., New York, N. Y. The invention relates to automobiles having a rear axle housing through which extends the rear or driving axle. The object is to provide a lubricating packing filling the spaces between the rear axles and the rear axle housings, intermediate the inner and outer roller bearings, and capable of preventing the lubricant within the gear casing from leaking out through the outer end of the housing and onto the tires.

SYSTEM FOR NUMBERING MOTOR CARS.—J. L. CATLETT, Vincennes, Ind. An object of the invention is to provide a simple method of numbering motor vehicles, so arranged that the vehicle may be guarded against theft, and the State against loss of fees, wherein a per-



SIDE VIEW OF CAR AND PLAN VIEW OF REMOVABLE HOLDER

manent number is provided for each car, and a removable record of the said number for each car. Two sets of plates being furnished by the State, and various colors indicating various years, every year the owner surrendering one set of plate and obtaining the other.

Designs

DESIGN FOR A TABLE.—G. POLL, c/o G. W. Poll & Co., 1918 Harman St., Brooklyn, New York.

DESIGN FOR A FINGER RING.—J. SIMMONS, c/o Goldman Kolber Co., 296 Broadway, New York City, N. Y.

A New Deal in the Transportation Industry

(Continued from page 374)

would never pay to lay rails but where there will be a large profit in using from one to two or three dozen trucks. This use, as it increases, will add greatly to the value of farms along the truck routes opened up, bring increased prosperity to the farmers and increased and cheaper food supply to the country.

To the shipper and to the general public the short haul by rail means the same excessive transportation costs that it does to the railroads. In the past years, there was no alternative. If the shipper wanted to send his product from Cleveland to Akron, he had no vehicle available other than the railroad. Although delays have been hindering more in recent years than in the past, these delays have always been a serious factor in the short-haul. Shipping time has always been out of proportion to the distance traveled on the short-haul. Furthermore, packing and crating charges which are unnecessary with trucks must be figured into the cost of the product to the consumer on all railway freight. The shorter the distance travelled, of course, the higher is the proportion of this cost.

One gain to be readily seen in any comparison between the railroad and the motor truck is the saving in favor of the truck on such items as packing and crating, cartage, tracing, switching and demurrage. While figures on all items of this nature are not always available and even when found sometimes present wide variations depending upon tonnage hauled, terminal facilities, character of freight, etc., the following costs, expressed in cents per hundred pounds, as determined by a large manufacturing company in New York, are representative:

Cartage charges from shipping platform to railroad siding, 15; cartage from freight house to consignee's receiving platform, 15; crating and packing, 24; with an additional 17 per cent increase in freight charges, due to the increased weight of shipments occasioned by crating and packing material. This totals $10.80 a ton, which must be added to freight costs.

Now that the increased freight tariffs are in force many instances where comparisons of costs in shipping by rail and by truck have heretofore been close, are showing a widening gap in favor of the truck. The largest increase in freight rates, as it happens, has been made effective in the eastern section where the highest development of truck transportation has taken place. With this increase, amounting to 40 per cent, there is every indication that shippers will analyze more closely than ever the cost of shipping by truck as compared with that of the railroad, in order that they may have an accurate picture of the relative saving which may or may not lie on the side of the truck.

Apart from the normal value of the motor truck in hauling freight at lower costs and with less loss of time, there is another factor which enters into the traffic situation of the present day; and that is the ability the truck possesses to relieve the railroads during the period of reorganization. Without a doubt, the railroad systems of the country are going into the next few years with their hands full of perplexing transportation problems, and with far too little equipment to handle their tasks as efficiently as they would like to. This will give the truck a very practical opportunity to show what it can do in relieving the railroads of some of their burdens.

The ability of the truck to assume this rôle has been proven over and over again. In almost every instance where the motor truck has been put to use, figures may easily be compiled to show how substantial this relief has been. The ability of the truck to act as a relief agent to the

railroads is proved quite emphatically by the Goodyear Akron-Cleveland route, wherein it is estimated by the National Automobile Chamber of Commerce, 885 freight cars are released every week for other and more profitable service.

This phase of transportation is more vital to the manufacturer, distributor and producer today than it has ever been before. At the present time this country operates approximately 2,400,000 freight cars. If, by the use of motor trucks on a 40-mile haul between Akron and Cleveland, 885 freight cars per week are released for other duties, a proportional saving over the total number of freight cars in operation the country over would mean a tremendous gain.

And the gain would not only be effected in some restricted industrial areas, but would extend to the Middle West and South where transportation is just as important in the work of bringing crops and live stock to market. Transportation is likely to be taken as a problem of local or sectional interest unless the adage of the chain and the weak link is borne in mind.

Transportation enters public life at two points: First, as a connecting link between the producer and the manufacturer; second, between the manufacturer and the consumer. A break in one connection is just as serious as a break in the other. In fact, the perplexing problems of moving the country's merchandise will be far along toward solution once the study of transportation is removed from a narrow, partisan plane and elevated to a position where it demands enlightened public interest.

The direct saving to the consuming public is perhaps the greatest justification for motor truck transportation where conditions are favorable to its adoption. Consider the food staple, milk, for example. One of the largest Detroit creameries distributes on an average of 43,510 gallons of milk every day. Of this quantity, gathered in a radius of seventy miles, 18,570 gallons are shipped into its Detroit plant by motor truck each day, as compared to a total of 16,560 gallons received by rail.

This is one instance where the motor truck, already able to compete with rail transportation on the old freight rates, will find its advantage even more pronounced now that the increase of twenty per cent in milk freight rates has gone into effect. Such savings bear directly on the pocket book of the individual, and as such will be given more and more attention and study as time goes on.

The final outcome of the present movement to let the motor truck assume a larger portion of the country's transportation tasks will mean a saving all along the line from the producer of raw material through the intermediate steps, manufacturer and wholesale distributor, to the public at the opposite end of the line. At the same time, the railroads will benefit by the saving of untold money spent now in handling traffic which as public servants they are required to handle, but which represents a heavy loss due to short, unprofitable hauls in less-than-carload lots. The farther the motor truck advances within its economic field, the greater will be the profit of the railroad, the manufacturer and the consumer.

Naturally, any development conducted on such a broad scale requires time. The railroads spent years in reaching the present point of perfection, and the motor truck will likewise spend considerable time before its maximum results can be felt. No one can say how long the period of development will be. Present-day figures, compiled by the National Automobile Chamber of Commerce, give the national registration of motor trucks as 750,000, and the annual production for 1919 as 316,364.

So far as the total potential tonnage of the motor truck is concerned, it has been conservatively estimated that the yearly average of around 500,000,000 tons will increase five or ten times when the truck is given the traffic now handled by the railroads at a loss, the traffic not handled at all, and the traffic that will appear as soon as facilities are provided.

A statement recently issued by Herbert Hoover pointed out that fifty per cent of farm produce rots on the ground for the want of transportation. There will be an immense amount of new traffic that will arise when means of moving it are provided.

The truck, therefore, appearing at a time when the transportation machinery would collapse without its help, has an almost infinite future. It has only begun to assume the burden it will ultimately bear. Its greatly increased use will be accompanied by vast benefits to its owners, to the railroads themselves, and most of all, to the general public.

Applying Radium to Cure Man's Ills

(Continued from page 375

glass vial, containing the radium, in an "applicator." This is a small brass tube, very accurately made so that the walls are of uniform thickness, with a screw cap, to which is fastened a brass wire. The whole is gold plated to render it sanitary.

The applicator stops the Alpha rays and some of the Beta rays. But to eliminate the Beta rays completely the applicator is placed inside a brass tube or "screen," also made with carefully gaged walls.

This precaution is necessary because when the flesh is exposed to the Beta rays for even a short time a deep burn results, and this is not only painful but dangerous. The bombardment of the metal in the screens by the Beta rays sets up secondary vibrations which also may cause bad burns. As a precaution against these the applicator and screens are wrapped in rubber.

If the spot to be treated is on the surface the radium may be applied in the form of a flat metal plaque, to which the radium is inlaid. Another form of plaque has a corrugated surface on which the glass vials containing radium are placed and the whole is then bound in place.

If the growth to be treated comes to the surface but is deep in the flesh, the radium is placed in the hollow point of a specially made non-corrosive steel needle and this needle is inserted in the growth during the application.

The radium may even be taken internally for the treatment of rheumatism, certain kidney and liver troubles, and intestinal troubles. Of course only a very minute amount is taken, usually in a liquid. The radium is absorbed into the blood and circulates throughout the system. No actual chemical action takes place, however, even when the radium is taken internally. It simply attacks useless tissues, which are then ejected from the body by the excretory organs. There is no danger of burns from the minute quantities which are taken internally.

Outlined here are only a few of the most-used methods of applying radium. When it is reflected that it was not until 1898 that Mme. Curie first isolated radium, and not until 1910 that the use of radium for the treatment of cancer was suggested, it is seen that the art is only in its infancy. But even now whole volumes have been written on the subject and the use of radium by the surgeon has progressed far from the experimental state.

Putting Paper on a Specification Basis

(Continued from page 375)

another in opposition to the extensive use of substitute materials. Cotton linters, to the extent of 700,000 bales a year, is available for paper manufacture; and where care is exercised to keep the material free of dirt and cinders a good quality paper results.

Annual Subscription Rates
Scientific American Publications

Scientific American (established 1845) one year $6.00
Scientific American Monthly (established 1876) one year $7.00
Postage prepaid in United States and possessions, Mexico, Cuba and Panama.

Foreign Postage

Scientific American $1.50 per year additional.
Scientific American Monthly 72c per year additional.

Canadian Postage

Scientific American 75c per year additional.
Scientific American Monthly 36c per year additional.

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, bank draft or check.

The use of lime and limestone in the pulp and paper industry is also being carefully scrutinized by the Government scientists in order to develop specifications for lime for the different industries, standard samples and laboratory and plant methods of analysis. Similar tests are under way relating to the restricted use of chlorine for the bleaching of wood pulp. The chlorine in the various kinds of pulp has been materially reduced as a consequence of these experiments without any decidedly deleterious effects on the color of the resultant paper.

What About Our Wheat Production?

(Continued from page 376)

Weld County then began to plant alfalfa as a rotative crop for the celebrated Greeley potato, as they found that the potato yield increased wonderfully when alternated with alfalfa.

Who can deny that the whole problem of refertilization of worn-out grain fields was settled by these farmers of northern Colorado? They not only demonstrated the science of green manuring but they happened to light upon the ideal plant for that important function.

Now I find in handling broadly the question of green-manuring the college professors, and the farm papers, prone to expend their efforts upon diffusive experimentation and discursive discussion. They treat green-manuring as a special process, all by itself, rather than as a part of regular farm routine. They talk about the vetches, cow peas, horse beans, soy beans, etc. If we stop to think a moment none of these is a standard farm crop and if used as an article of green manuring each must be treated specifically, whereas alfalfa is a valuable standard farm crop, and by its use may be utilized as a green manure crop without any break in farm production; that is, no time will be lost in producing a green manure crop, because it is already produced, and may be plowed under any fall and the land seeded to some other crop the next spring.

Another instance of refertilization by means of crop rotation I have recently observed in California: It is the case of sugar beet culture. The culture of sugar beets greatly improves the fertility of the land. Investigations made by the California College of Agriculture showed the following increases in the yield of various crops upon land previously cropped to sugar beets:

Wheat, yield before beet culture, 24.5 bushels; after beet culture, 41.3 bushels; per cent increase, 68.6.

Rye, yield before beet culture, 28.4 bushels; after beet culture, 40.8; increase per cent, 43.7.

Oats, yield before beet culture, 61.8 bushels; after beet culture 75.3 bushels; increase per cent, 21.8.

Barley, yield before beet culture, 23.2 bushels; after beet culture, 43.5 bushels; increase per cent, 87.5.

Potatoes, yield before beet culture, 218.6; after beet culture, 238.0 bushels; increase per cent, 8.97.

Rape, yield before beet culture, 23.2 bushels; after beet culture, 48.8; increase per cent, 110.

Here we discover a natural and easy process of producing our sugar, bread, potatoes, etc., in rotation, and at the same time maintaining the maximum fertility of our soils.

Why We Need a Separate Trade-Mark Bureau

(Continued from page 377)

enabling the utilization of kerosene instead of gasoline in an engine and if so who is the rightful inventor thereof, and in doing so to consider all the fine points of chemistry and physics involved; and immediately afterward to decide whether

in purchasing a can of olive oil, a housewife might be confused by encountering in the same grocery store cans of olive oil labeled "Sunlight" alongside of other cans of the same commodity labeled "Moonlight."

In practically all English-speaking countries except the United States there is a Trade-Mark Office separate from the Patent Office and a Registrar of Trade-Marks distinguished from and not in any way subordinate to the Commissioner of Patents. Moreover, in the majority of foreign countries, both the Patent and the Trade-mark Offices are a part of the Executive Department corresponding to our Department of Commerce, as for instance in England where these offices are in the Board of Trade and in Canada where they are in the Department of Trade and Commerce.

In connection with the establishment of a separate Trade-mark Bureau and a Registrar of Trade-marks, consideration might well be given to the question of placing in such bureau and under the authority of such official the present function exercised by the Bureau of Foreign and Domestic Commerce, of advising our manufacturers and exporters of the necessity of prompt and adequate protection of their trade-marks abroad, and of how to obtain such protection, and of calling to the attention of trade-mark owners apparent attempts to pirate their trade-marks in foreign countries as noted in foreign trade-mark gazettes, reports from commercial attachés, consular officers, etc. At present, the Bureau of Foreign and Domestic Commerce is handicapped in this work by insufficient knowledge of the ownership and status of the various trade-marks and trade-names; while the Patent Office, because of lack of familiarity with the necessities of export trade and of foreign trade-mark laws and practice, is unable to coöperate as it should in the protection of American trade-marks abroad.

Twentieth Century Telegraphy

(*Continued on page 378*)

length, although each one sends a separate letter over the circuit, and as the entire operation is automatic there are no variations of any kind to disturb the impartial distribution.

The impulses received at the distant end from the sending distributor pass through a receiving distributor which switches them accurately to the various receiving typewriters. Here the impulses are translated by selector devices into action on the typebars, the result of each impulse being to strike the proper letter on the telegram blank. The two distributors are kept in perfect synchronism, resulting in perfect distribution, by "phonic wheels" or tuning forks. The impulses are caused in the first place by perforations punched in a type by a typewriter keyboard on which the operator "copies" the message to be sent. All this takes place at such a high speed that the capacity of one wire is raised as high as twelve thousand words an hour in each direction.

There are 24 trunk tubes which enter the main office from Market Street. The tubing is of pure copper, which resists electrolysis and chemical action, and also presents an ever smooth surface to the carriers. The longest single tube is one mile in length, the compressed air driving the cartridge message-containers through the tubes at a speed of 40 feet per second. The tubing used is in sections 15 feet in length. Big air compressors operate a combination pressure-vacuum circulating loop system, driving and pulling simultaneously. The tubes are laid with a drainage slope with special equipment for keeping the low spots clear of condensed moisture.

Entering the main San Francisco office are 2,000 wires containing the existing working circuits, spare facilities and provision for growth and extension. These wires terminate in a switchboard, the operation of which is by means of plugs and cords, which enable the various lines to be connected to different sending and receiving positions, to battery sources, etc.

Taking on Oil a Mile at Sea

(*Continued from page 380*)

the connection made to the hose, six short blasts are blown on the siren of the vessel, this being a signal to "stand by." In answer to these six blasts the shore siren emits similar blasts. Then as soon as the mooring master is satisfied that everything is O. K. he blows one whistle from the ship. This is the signal to start pumping slowly from the shore and is immediately answered by the shore station. As soon as the pumping process has been completed the mooring master signals by three blasts from the ship's siren and the process is brought to a stop. The ship, now loaded, receives her papers, unmoors and gets ready to sail.

The world's largest tank steamer, the "Standard," whose capacity is 118,000 barrels has already been moored in one hour. The pumping was started forty minutes later, and the ship was loaded twenty-seven hours and fifty-five minutes later. An hour after the vessel sailed, making a total time in port of only thirty hours and twenty-five minutes, with an average pumping rate of 4,253 barrels an hour. This particular vessel was never loaded and dispatched in such quick time before.

As a rule, the crude oil is pumped from the shore tanks at its natural temperature. When greater speed in loading is desired the oil can be heated, but the sea water is warm and it rarely becomes necessary to increase the fluidity of the oil to enable the pumps to handle it.

The Heavens in October, 1920

(*Continued from page 382*)

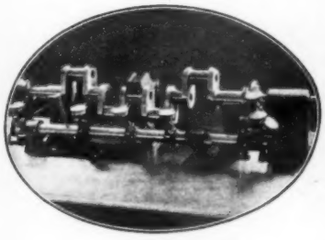
and rises at 3:20 A. M. in the middle of the month.

Uranus is in Aquarius, and observable all the evening. Neptune is in Cancer, and visible only in the early morning.

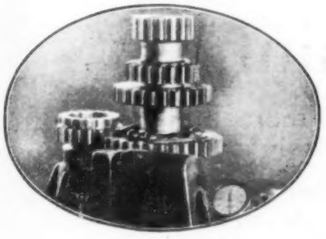
The moon is in her last quarter at 8 P. M. on the 4th, new at the same hour on the 11th, in her first quarter at 7 P. M. on the 19th, and full at 9 A. M. on the 27th. She is nearest the earth on the 4th, farthest away on the 18th, and at her nearest approach again on the 30th. During the month she passes near Neptune on the 7th, Jupiter on the 9th, Saturn later on the same day, Mercury on the 13th, Venus on the 14th, Mars on the 17th and Uranus on the 22nd.

At the present full moon a total eclipse occurs, which is invisible from the eastern United States, but partly visible in the western section of the country, and wholly visible throughout most of Asia and Australia. The moon enters the earth's shadow at 7:26 A. M. (eastern standard time), becomes completely immersed in it at 8:29, and gets finally clear at 10:57. From these data it is evident that during the whole eclipse the sun is above our horizon, and the (full) moon therefore below it. But since, in the latitude of 40°, which is taken as the basis of these predictions, the sun rises at 6:30 A. M., local standard time, on the day of the eclipse, it follows that, for points in about the longitude of Chicago, the moon will set just as the eclipse begins, while observers farther west will have a fine chance to see it. On the Pacific Coast, totality will begin well before sunrise, and the spectacle will be of real interest to the early riser.

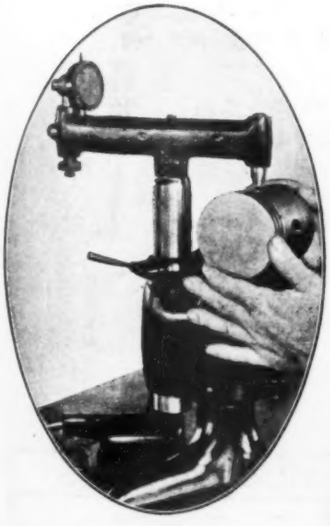
How Lincoln Cars are Leland-built



Crankshafts are held to one-thousandth accuracy in truth of bearings, fly-wheel flange and gear-end fit.



After assembling, the constant mesh transmission gear is held to one-thousandth accuracy in concentricity, by rolling test with a master gear.



By the Amplifyer, which registers the one ten-thousandth of an inch, every piston is tested for diameter and concentricity to one-thousandth accuracy.

Since the making of motor cars began and passing time saw the advents of new creations, it is doubtful whether there has ever been an achievement of which so much has been expected as of the Leland-built Lincoln car.

Quite naturally should this be true, because—as has been so aptly said—this car has practically the entire automotive industry as its legitimate ancestry; and because— as also has been aptly said—if the achievements of a Leland organization are to be surpassed, it is only logical to look to a Leland organization to surpass them; again because the Lincoln car is produced by men now equipped to turn vast experience to best account, by men devoting their every effort and their every talent to making a car such as has never been made before; in fact, to making a car such as motordom perhaps has never expected to enjoy.

To accomplish this, we have what is deemed advanced design, re-enforced by greater precision in the making of the parts.

This is only logical to expect of men who, the world over, are recognized as pioneers of advanced ideas, and as foremost exponents of precision methods.

As a symbol of fineness, 'hairsbreadth' is the term most frequently applied, yet 'hairsbreadth' in a Leland-built Lincoln car symbolizes merely one of the coarser measurements.

Take a hair from your head (the average is about $2\frac{1}{2}$ thousandths of an inch in thickness) and if you could split that hair into ten strands of uniform dimensions, just one of those strands would give a fair conception of the closeness to a mean standard prescribed in more than 300 operations.

In the Leland-built Lincoln car, there are more than 5,000 operations in which the deviation from a mean standard is not permitted to exceed the one one-thousandth of an inch more than 1,200 in which it is not permitted to exceed a half of one-thousandth, and more than 300 in which it is not permitted to exceed a quarter of one-thousandth.

The illustrations herewith represent mere examples of the literally thousands upon thousands of devices, tools and gauges employed to insure these Leland standards of precision.

If the entire contents of this publication were devoted to a description of the seeming limitless number of fine and close mechanical operations, the story even then would not half be told. If you were personally to inspect and have them all explained, it would require months to do so.

But precision, for mere precision's sake alone means little. It is only when that precision lends itself to some practical benefit that it becomes a virtue.

To cite an extreme example; it would be absurd to prescribe that a running-board, or a fender be held within a hundredth of an inch limit; yet a limit so liberal in thousandths of essentially accurate parts would be fatal.

Precision, mis-applied, is unwarranted and wasteful, and lends itself to no advantage.

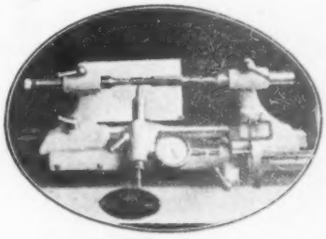
Precision, un-applied, means harshness, vibration, rapid wear, disintegration and expensive maintenance.

Precision, skilfully and scientifically applied, comes only from knowing where and knowing how to apply it.

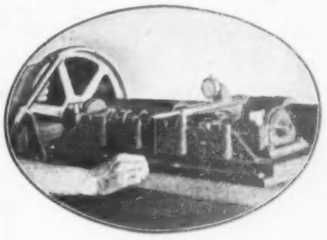
Then, and then only, can it express itself in greater smoothness, in greater power, in greater comfort, in longer life, and in minimum maintenance.

Then, and then only, can it make for the supreme delights and for the consummate satisfaction in motor car possession.

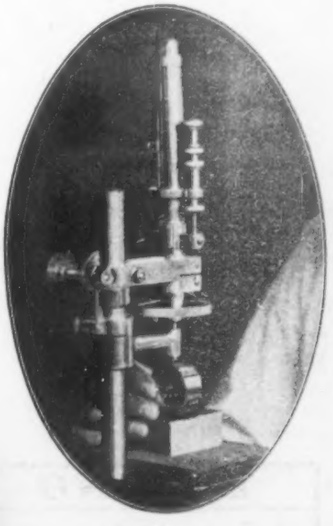
This, briefly, is how Lincoln cars are Leland-built.



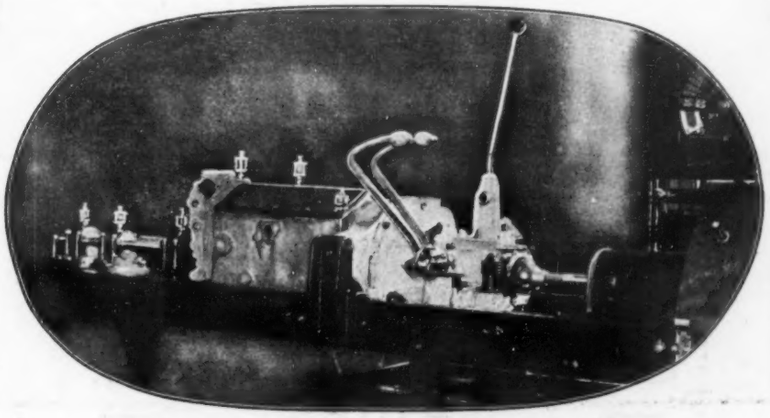
Cams are held to one-half degree accuracy in contour to insure correct valve timing.



Testing accuracy of lead on plug thread gauge, held to limit of two ten-thousandths in one inch of travel.



By the Comparator, which registers to the one twenty-thousandth of an inch, this plug thread gauge is held to three ten-thousandths accuracy in pitch diameter.



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